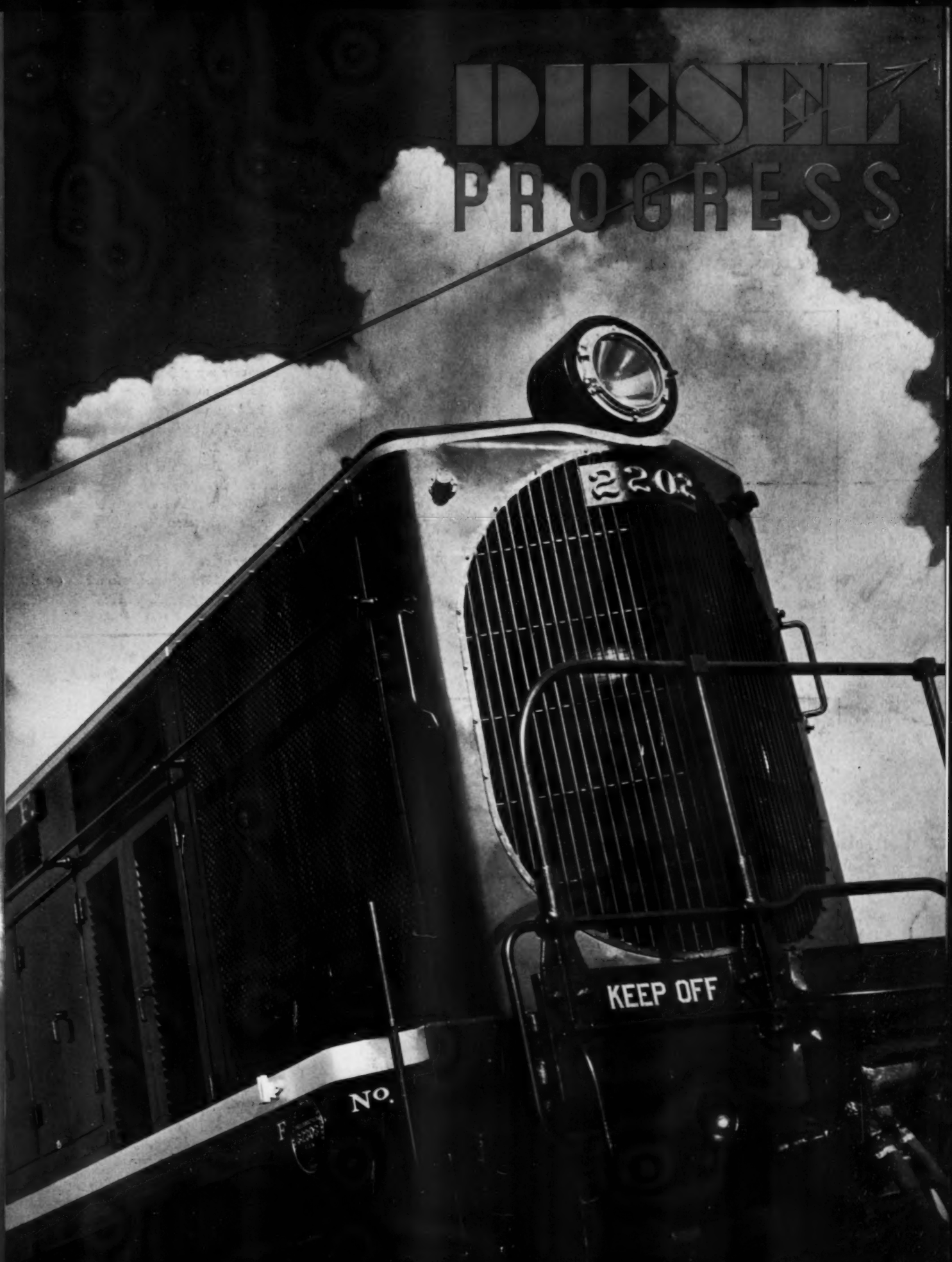
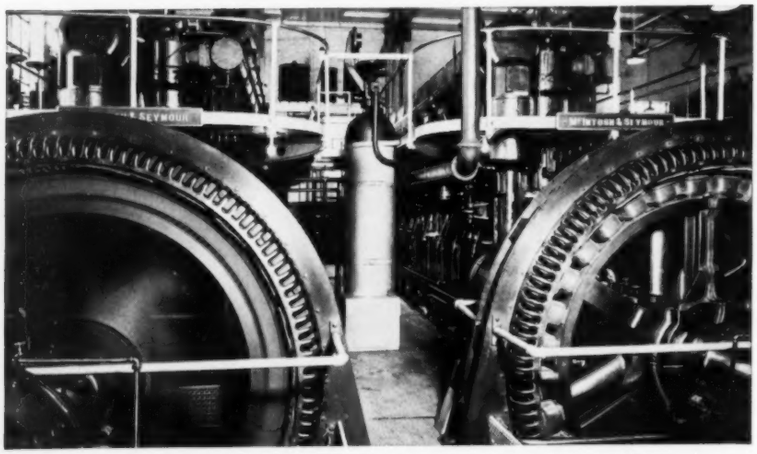
DIESEL PROGRESS

IN INDUSTRY • IN TRANSPORTATION • ON THE SEA • IN THE AIR



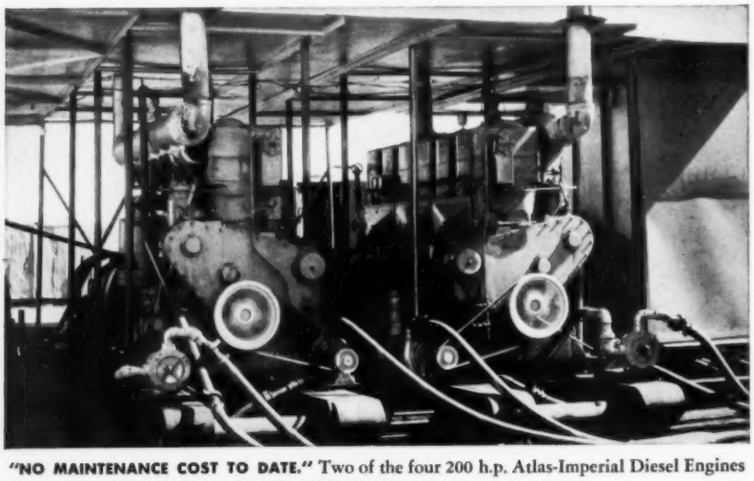
DECEMBER, 1939 CIRCULATION OF THIS ISSUE—IN EXCESS OF 14,000 COPIES 25c

3 WIDESPREAD EXAMPLES OF WORK WITH LITTLE WEAR



"SMALL AMOUNT OF CYLINDER WEAR," is the way the engineer's report reads. It refers to the two 900 h.p. McIntosh & Seymour Diesel Engines in the electric light plant at Tarboro, No. Carolina.

Size of cylinders 17" dia. After 49,000 hours of operation, greatest wear is .010", smallest .002". Engines lubricated with Texaco Ursa Oil 100%, "No trouble with carbon . . rings free."



"NO MAINTENANCE COST TO DATE." Two of the four 200 h.p. Atlas-Imperial Diesel Engines of the J. E. Farrell Drilling Co., Fort Worth, Texas.

This equipment has drilled fourteen oil wells.

Engines are operated continuously for 30-day periods in this grueling service.

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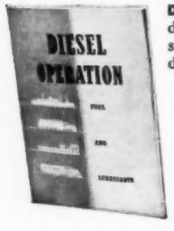
For prompt engineering service and deliveries, phone the nearest of our 2279 warehouses in the U. S., or write: The Texas Company, 135 E. 42nd St., New York, N. Y.

"VERY LITTLE WEAR" after a year's service, reads the report on this tractor, built by the Lombard Traction Engine Co., Waterville, Maine. In 35 days, this equipment hauled 5,729 cords of pulpwood, each weighing 3,600 lbs., or a pile 4 feet high measuring 868 feet long.

Its 6-cylinder Fairbanks-Morse Diesel Engine is lubricated with Texaco Algol Oil. No stuck rings, very little wear, is the report. Photos show tractor with wheels and with sleds.



DIESEL OPERATION, 80 pages of charts, diagrams, photographs and text that answer many questions that come up each day. Write for your copy.

TEXACO

TEXACO ALGOL and URSA OILS

DIESEL PROGRESS for December, 1939. Volume V, Number 12. DIESEL PROGRESS is published monthly by Diesel Engines, Inc., 2 West Forty-fifth Street, New York, N. Y. Rex W. Wadman, President. Acceptance under the Act of June 5, 1934, at Brooklyn, New York, authorized May 14, 1935. Subscription rates: United States and Possessions $3.00. Canada and all other countries $5.00 per year. Single copy price 25 cents in U. S. A., 50 cents for all other countries.

DIESEL PROGRESS and DIESEL AVIATION

REX W. WADMAN
Editor and Publisher

FRONT COVER ILLUSTRATION: One of five Diesel-Electric switching locomotives, equipped with a 1,000 hp. De La Vergne Diesel engine, built for the Atchison, Topeka & Santa Fe Railway by The Baldwin Locomotive Works.

TABLE OF CONTENTS ILLUSTRATION: The Utah Poultry Producers Association of Salt Lake City, Utah, use this Caterpillar Diesel mounted on a truck to drive a hay chopper. Grinds one ton in sixteen minutes, operates ten hours a day on three gallons of fuel per hour, and has a record of over 15,000 hours of successful operation to its credit.

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HEYWORTH CAMPBELL
Art Director

PAUL H. WILKINSON
Aviation Editor

DECEMBER CONTENTS

TWIN-SCREW DIESEL CRUISER "EPISODE"

RECENTLY completed at the Annapolis Yacht Yard, Annapolis, Maryland, for a prominent Pennsylvania yachtsman, the twin-screw Diesel cruiser *Episode* comes from the design of Nelson and Almen, naval architects. From the standpoint of appearance, equipment, and appointment, the *Episode* qualifies as one of the smartest jobs of her class to be turned out this year.

The main propulsion engines selected for this new yacht are a pair of 8-cylinder, 4-cycle, 4½ in. bore, 5¾ in. stroke, Model MRA-8, Superior Diesels developing 150 hp. each at 1,800 rpm. The speed of the *Episode* is 15½ miles per hour, her twin Columbian bronze propellers being driven through combination reverse and reduction gears.

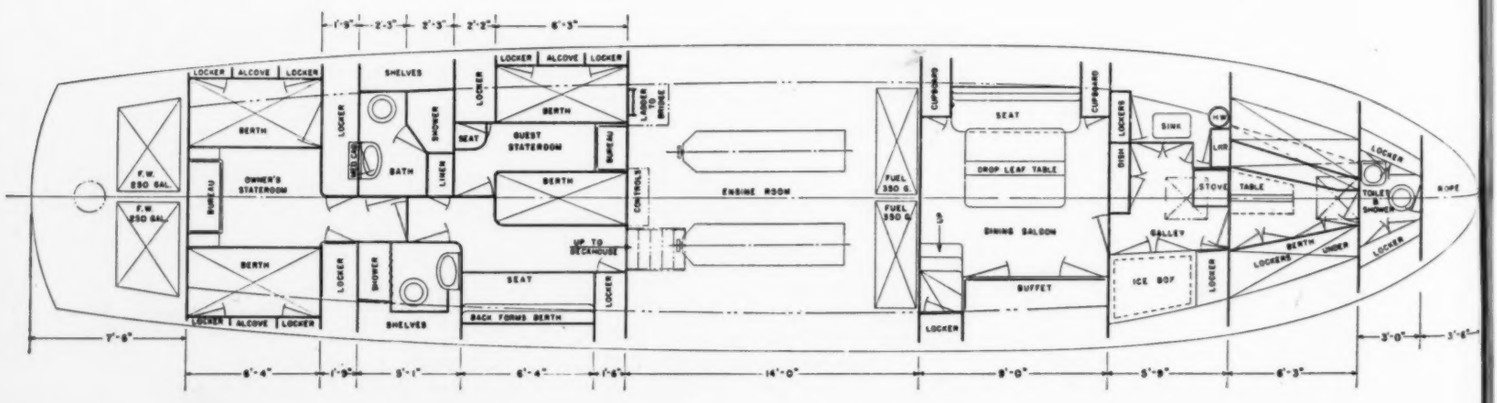
The main engines are true right and left, with injection sides facing center and the exhaust sides facing outboard. The built-in closed fresh water cooling systems have a 5 gallon surge tank for each engine. Raw water is pumped through the heat exchanger and then discharged through the copper jacketed exhaust connections to the silencers. Bosch injection systems and Maxim exhaust silencers are used. The yacht is heated throughout by a Preferred Utilities oil-fired hot water heating system.

A 1½ kw. Stover Diesel-electric generating set supplies current for lighting and electrically-driven auxiliaries and for charging a bank of 32 v. Philco storage batteries. Current for the engine electric starters is supplied by 30 v. Willard storage batteries. The main engines are mounted on solid beds while the auxiliary generating set is mounted on a Korfund spring base.

All machinery, including fuel tanks with a total capacity of 700 gallons, which are installed against the forward bulkhead, is located in the insulated machinery compartment amidships below the deckhouse.

This new yacht measures 70 ft. 3 in. length over all, 15 ft. 3 in. width, and 4 ft. 9 in. draft. She displaces 72,000 pounds in salt water which is equivalent to 32.1 long tons. With her enclosed deckhouse amidships, she is designated as the raised-deck and trunk-cabin type yacht. The bow stem follows the smart hollow contour; the transom is strongly curved. The most approved materials of construction are used throughout. Keel and framing are of selected white oak with double planking, the inside layer being of white cedar, the outside layer of mahogany with Everdur bronze fastenings used throughout. Decks are also double thickness with natural teak used in the upper layer. Honduras mahogany is used throughout the exterior joinery, including the deckhouse, cabin trunk, and flying bridge. The owner's quarters, below decks, are finished with Weldwood painted a light color. The yacht is divided into five water-tight compartments by four steel bulkheads, and sound and heat insulation has been freely employed where necessary.

The crew's quarters are forward below decks, directly aft the rope locker, and include liberal locker space, shower, toilet, berths, and table. The roomy, completely-equipped galley is next aft occupying the full width of the yacht. The dining saloon, abaft the galley, is finished throughout in white mahogany, and is richly appointed with cushioned seat on one side buffet on the other side, and a drop-leaf table center. Large cupboard space is also provided.



A pair of 8-cylinder Superior Diesels propel the 70′ 3″ cruiser "Episode" at 15½ miles per hour. A 5 kw. Diesel-electric generating set supplies current for her lighting and home-like deckhouse living room. This room is indirectly lighted and fitted with Venetian blinds.

Stairs lead from the dining saloon to the deckhouse which is directly above.

Owner's quarters are abaft the engine room with owner's stateroom aft. Forward is the two-berth guest room to port, with a passageway stateroom opposite. A bed davenport in the deckhouse provides additional guest space. Two 250-gallon fresh water tanks are installed in the stern.

Fire protection equipment is a Lux-Automatic system. Two small boats, a Class D sailing dinghy, and a motor boat are stowed on the cabin trunk aft.

The navigator's bridge is protected by a standing shelter and is located abaft the deckhouse. The bridge is equipped with complete controls and instruments for maneuvering the engines and for navigation. The summation of the *Episode's* design spells seaworthiness, dependability, and luxurious comfort. She is typical of the company that Diesels keep.

View showing the two Superior Diesel propulsion engines. These engines are electrically started and are maneuvered from the navigator's bridge. Note the trolley hoist beams over each engine.

The Great Southern Hotel, Gulfport, Miss., one of the South's famous hostelries, depends on Diesels for all of its electrical requirements.

PROGRESSIVE DIESEL ECONOMIES

By WARREN GLEASON

THE Great Southern Hotel, a beautiful home-like hostelry of Gulfport, Mississippi, built in 1903, with its two hundred big and comfortable rooms facing upon the Gulf of Mexico, is familiar to all who have travelled U. S. Highway 90, or the Spanish Trail.

Mr. S. J. Savarese, manager of the Great Southern Hotel, is primarily an engineer and as such is vitally interested in power costs. Accordingly, he has always advocated desirable innovations and improvements. Therefore, about a year ago, a full Diesel-Electric installation for light and power was made under his supervision and according to his ideas and specifications for the entire hotel.

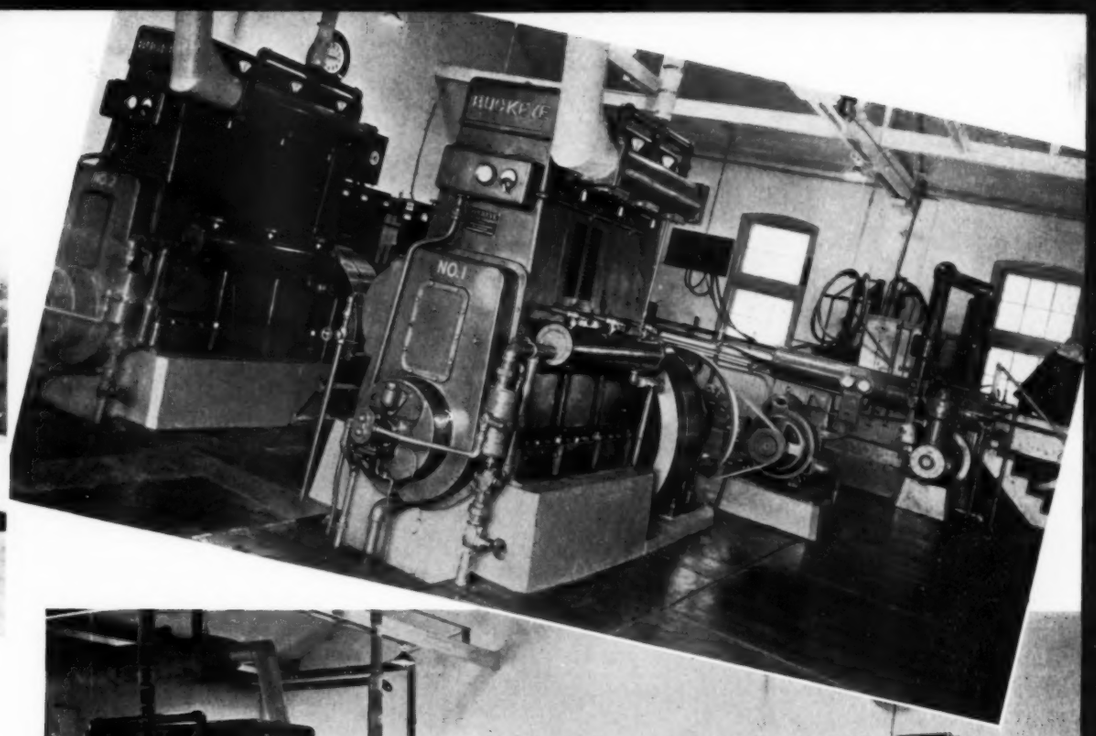
The engine room was rebuilt from the ground up, with a reinforced concrete base to sustain the weight of the new engines and to allow for the added burden of any eventual additions or developments. Two Buckeye Diesels of 112 hp. at 400 rpm. were installed, the machines being furnished by New Orleans Electrical Engineering, distributors for Buckeye.

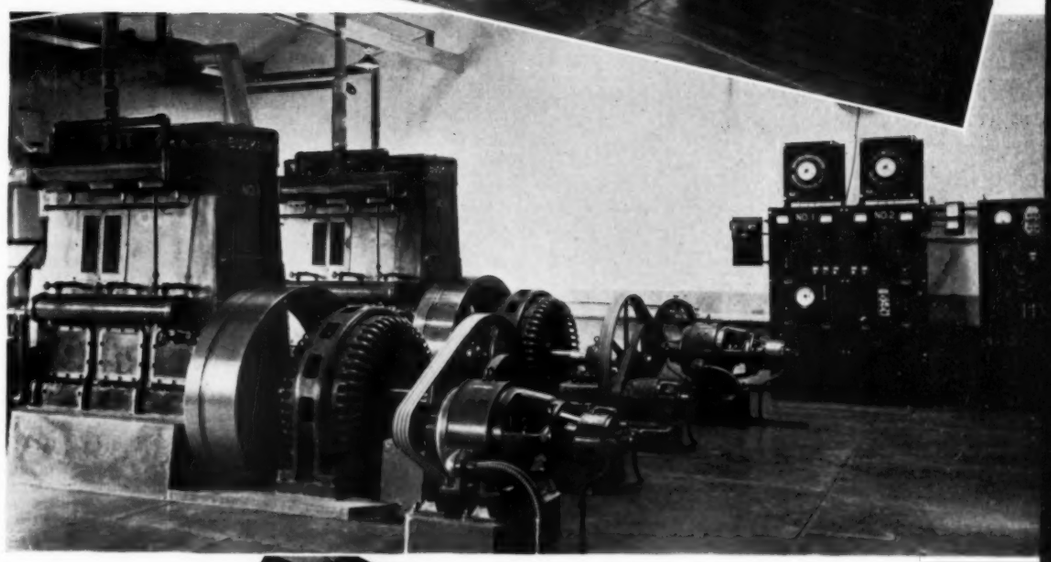
Each engine drives a 75-kw. Elliott generator and, as for actual cost of electricity produced, Mr. Savarese stated that his plant will deliver current to the switchboard for not over one cent per kilowatt. This is an age of electrical usage; a hotel, nowadays, especially one situated in the warmer climates, must provide ceiling fans or other current-consuming cooling or air-conditioning apparatus. There are elevators to be kept running, radios, electric signs, and many electrical appliances in the kitchens, offices and guest-rooms to be supplied with current. So, the lowered cost of current for normal uses is itself sufficient ground for changing to Diesel engines, and with many users the matter might well rest there. These smooth-running, three-cylinder Buckeyes, however, made so little fuss about delivering so much more power than was expected of them, that something had to be done to take advantage of all this cheap and available current. So there is an ice-machine, a York eight-ton compressor, and the savings in the ice bill alone more than pay for the entire fuel bill of the Diesel engines. And as the hotel has its own artesian well, providing an almost unlimited supply of the purest water obtainable, the ice situation is now sitting pretty.

Still there was power to spare; therefore, more money to be saved. Consequently, the hotel now maintains its own laundry and there is an abundant supply of power to operate its two big washing machines, two electric ironing machines, a centrifugal extractor, and a tumbler dryer of sufficient capacity to accommodate this up-to-date laundry.

There is another angle to this money-saving. As before stated, the water supply is bountiful as it spouts out of the ground with no meter bills attached and at a constant temperature of eighty degrees the year 'round. The next step is the enlightening fact that, according to Mr. Charles A. Webb, chief engineer, the insides of his Buckeyes are just as clean as the outsides; which are spotless. Therefore, the cooling water comes out of the engine jackets just as clean as it enters.

This water, now heated, is stepped up a little further by use of an exhaust heat boiler. From the boiler the water, now at a temperature of around one hundred twenty degrees or slightly less depending upon the load under which the Diesels are operating, passes to a storage tank of five hundred gallons capacity. From there it



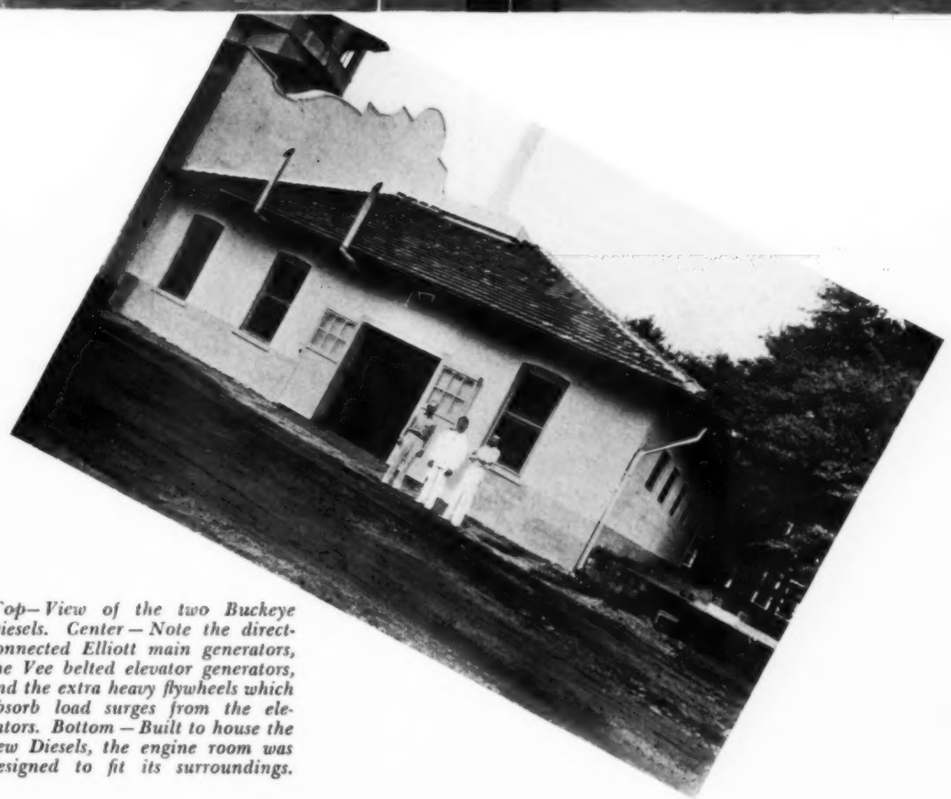


is piped to a gas-heating apparatus where it is further heated to a temperature of one hundred sixty degrees and from thence into the hotel hot-water circulating system. A constant and entirely adequate supply of hot water is accordingly available, using a minimum amount of gas.

Other money-saving developments will come in their turn and are being constantly studied. At present a very complete wood-working machine shop is being added. Equipment now ready for installation includes a bandsaw, a circular or cut-off saw, a planer, a joiner, and a drill-press. All these machines will be driven, like the laundry machines, by individual electric motors with no line shafting. In this shop practically all repairs of any nature can be made to anything constructed of wood, including furniture.

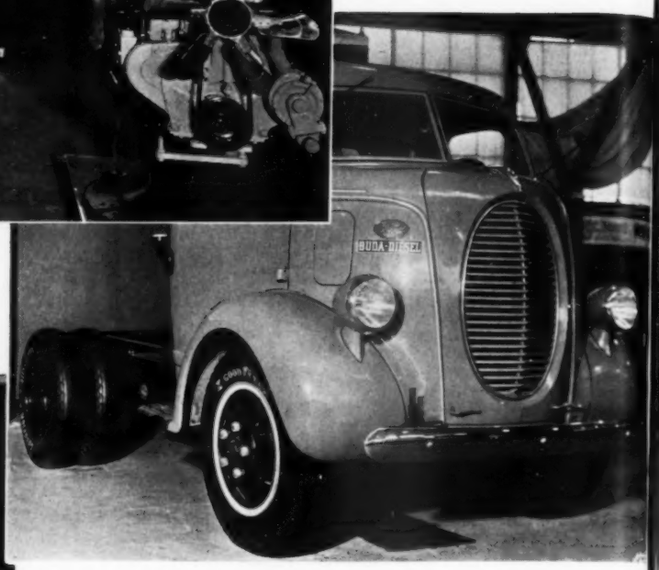
The engines are operated alternately for periods of sixty days, at the end of which periods the lubricating oil is changed. During the sixty-day operating period it is sometimes necessary to add lubricating oil, according to variation in load demands, but lube oil consumption is gratifyingly low. The engines are equipped with "Clear-Oil" filters, made by the DeLuxe Products Corporation.

Each engine, beside driving its direct-connected main generator, also drives a separate generator connected to a separate switch-board for elevator service exclusively. Both the elevator and main switchboards are equipped with Simplex voltage regulators for maintaining constant voltage. No demands for current have as yet been made upon the Buckeyes which were not fully and easily met.



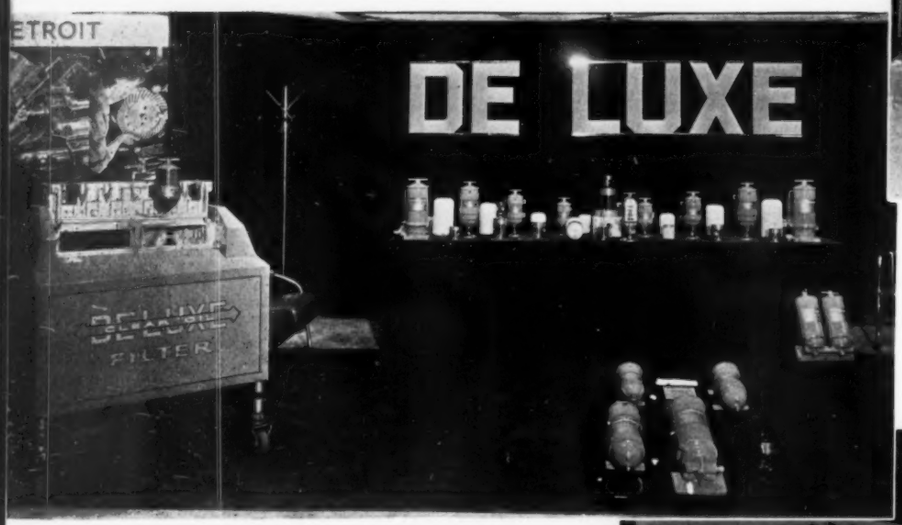
Top—View of the two Buckeye Diesels. Center—Note the direct-connected Elliott main generators, the Vee belted elevator generators, and the extra heavy flywheels which absorb load surges from the elevators. Bottom—Built to house the new Diesels, the engine room was designed to fit its surroundings.

The Buda-Lanova Diesel exhibit consisted of a 6-cylinder Model DT-317, a 6-cylinder Model DT-389, a 6-cylinder Model DT-468, a 6-cylinder Model DH-691, and a 4-cylinder Model 4-DT-212.



The Beattie Motor Company, Chicago Ford Dealers, exhibited this Ford Cab-Over-Engine unit powered with a Buda Model 6-DT-317 Diesel — a special Ford package unit, in the 6-cylinder size.

Waukesha put on a good demonstration of the Waukesha Multi-Fuel engine which operated on fuel oil or gasoline with only fuel accessory changes.

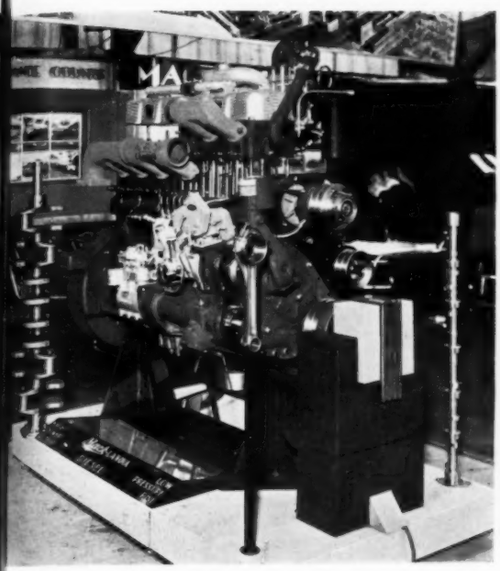


DeLuxe Products' exhibit was largely devoted to filters designed for use on Diesel engines. They also showed some special Diesel pistons which proved of interest to the Diesel engineers attending the show.

CHICAGO, November 8th. Diesels dominated this show here in Chicago, just as Diesels dominated the Truck Show in New York last year. That's what the truck owners and truck drivers came into this Show to see — Diesels — and they saw them; not as many as they should have seen, but the interest in the Diesels exhibited well repaid those exhibitors for the time and expense incurred in getting their exhibit together and keeping a staff here for ten days.

Both Buda and Hercules had splendid Diesel engine exhibits. Waukesha, with its Poly-Fuel engine exhibit and demonstration, drew the crowds, too. The most spectacular Diesel truck exhibited was the 50,000 lb. capacity coal-hauler by Walter equipped with a Cummins Diesel (see illustration on opposite page). The Ford Cab-Over-Engine job with a 6-cylinder Buda Diesel held their interest — as well it might: It's a smart job.

THE NATIONAL MOTOR TRUCK SHOW

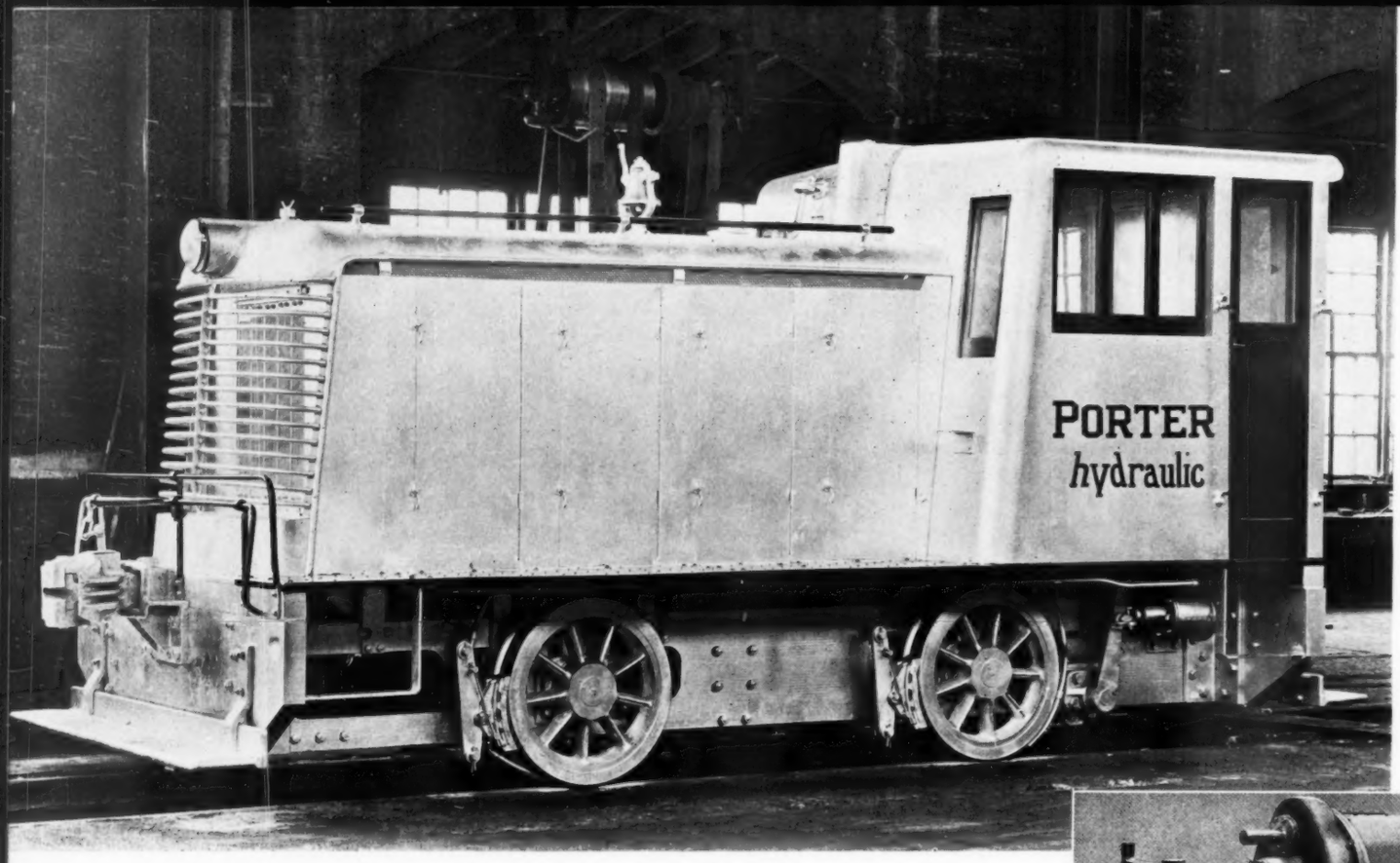


The high spot of the Mack Truck exhibit was the cutaway model of their standard Mack-Lanova Diesel truck engine, illustrating the simplicity of design, ruggedness of construction, and ease of operation.

The Hercules Diesel Exhibit featured the two latest additions to their line — the series DFX — the new pancake type Diesel — and the new 2-cylinder series DIX. In addition to which, the Hercules Diesel Ford Conversion Unit was well displayed.

The Walter Coal Hauling Unit used in strip coal-mining operations. Capacity 33 cu. yds. Powered with a 6-cylinder 150 hp. Cummins Diesel. When turning radius at the mine permits, two of these trailers are handled by this tractor, giving a gross assembly weight of 80 tons.

The Pierce Governor Exhibit was a bit out of the ordinary, inasmuch as they showed actual models of many of the engines, both gasoline and Diesel, on which their Governors and other equipment are used. An impressive and very interesting exhibit.



25 ton Porter Hydraulic Switching Locomotive — Hercules Diesel-powered.

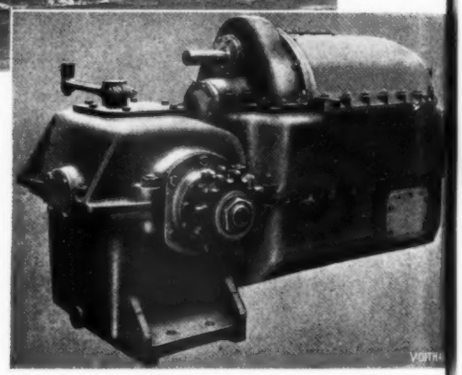


Fig. 1. Close-up of the Voith Turbo Transmission.

PORTER DIESEL HYDRAULIC LOCOMOTIVE

By REX W. WADMAN

PITTSBURGH, Pa.—November 14, 1939. The rapid development in the application of the torque converter principle to Diesel drives is extremely interesting. Last month, on pages 20 to 23, we discussed the application of torque converters to oil field drives. On pages 19 to 21 of the September issue we covered the torque converter application in a large switching locomotive. This month I went over to Pittsburgh to see the successful adaptation of a combination torque converter and hydraulic coupling to a 25 ton switcher. This newest American development in motive power is the Porter Diesel Hydraulic Locomotive, completed recently at the works of H. K. Porter Company, Inc., Pittsburgh, Pa. This locomotive employs a hydraulic drive principle similar to the one now rapidly coming into prominence in the automotive field and discussed in detail in previous articles appearing in DIESEL PROGRESS. It is a 25-ton standard gauge locomotive that develops a starting tractive force of 16,600 pounds. Its maximum speed is eighteen miles per hour. It is of heavy steel mill type construction as is clearly indicated by the accompanying illustrations. The main frames are of slab steel thoroughly annealed and strongly braced. Bumpers, also, are of slab steel. The axles are of forged open-hearth steel and the driving boxes are of cast steel equipped with Timken roller bearings. The locomotive is cross-equalized to provide for three point suspension. The four steel-tired drivers are 33 in. diameter and the wheelbase is 7 ft. 1 15/16 in.

The power unit is a Hercules model DHXB, 5 in bore x 6 in stroke, 6 cylinder Diesel engine. The Diesel is connected directly through a flexible coupling to the power intake shaft of the Voith-Turbo transmission. The output shaft of the hydraulic transmission drives the Porter heavy duty reverse unit from which the power is transmitted to the axles by means of heavy roller chains — one to each axle.

There is no mechanical connection between the engine and the driving wheels — all of the power is transmitted by means of fluid drive. It will be noted that friction clutches, which normally are a constant source of trouble in mechanical drive locomotives, are eliminated. The engine is relieved of all shocks and cannot be stalled under any load condition.

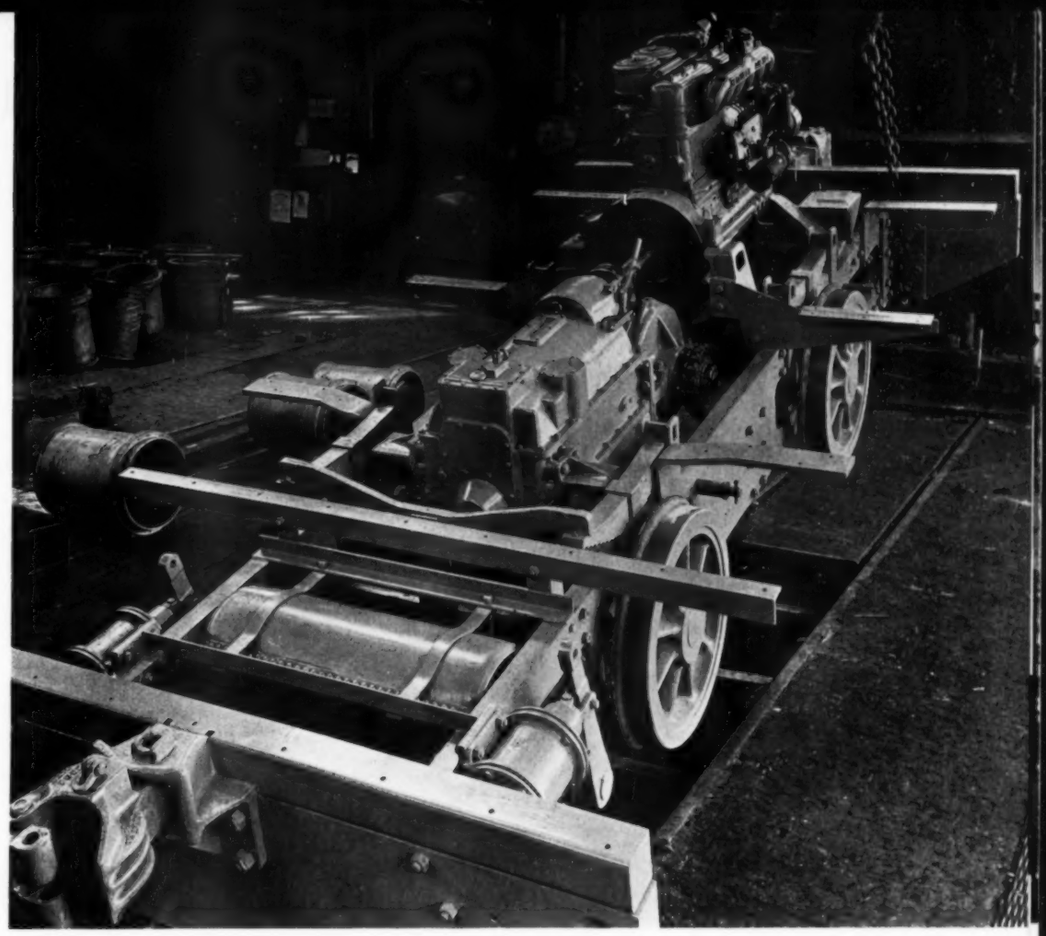
The power transmission apparatus consists of a Voith Turbo transmission, supplied by the Hydraulic Coupling Division of the American

Blower Corporation, a Porter reverse gear, and chain drive. The transmission and reverse gear are shown in Fig. 1 and it will be noted that the reverse gear is mounted integral with the transmission housing.

Fig. 2 shows a cross section of the hydraulic unit which includes a torque converter and two fluid couplings. Shaft (a) is connected to the driving engine and power is transmitted through the step-up gear to the primary elements of the hydraulic circuits. Each of the fluid couplings consists of an impeller or pump wheel and a runner or turbine wheel, while the torque converter, in addition to its rotating members, has a set of stationary guide vanes. Converter (b) is used in starting and at low speeds where high torque is required, thus assuming the function of "low gear" in an automobile, while the couplings (c) and (d) transmit the power at medium and high speeds respectively. Converter (b) and coupling (c) drive through step-down gear (h), while coupling (d) drives through step-down gear (i). The different ratios of these two gears provide second and third speeds.

It will be seen that the gears are in constant mesh and no shifting of gears is required. The various characteristics of power transmission required are obtained by selectively filling one of the three hydraulic circuits in such a way that converter (b) is filled at low speeds, coupling (c) at medium, and coupling (d) at the higher speeds.

Only one hydraulic circuit is in operation, that is, filled with oil, at a time. If it becomes necessary to "shift gears" or, in other words, switch from one circuit to another, the former is emptied while, at the same time, the next circuit is being filled, so there is a smooth uninterrupted flow of power at all times. The oil from the circuits when being drained flows into the sump tank at the bottom of casing (1), from where the filling pump returns it to the transmission, at the same time by-passing some of the oil through a cooler which is not shown.



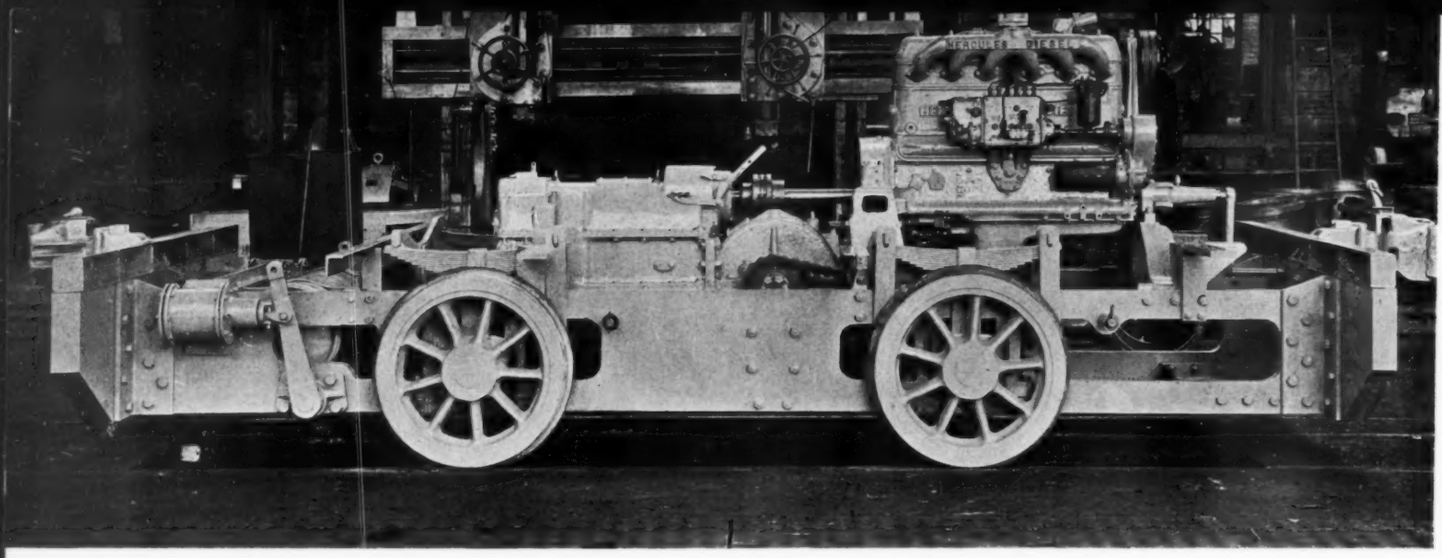
The Porter Locomotive in the shops illustrationg how the chain drives are located for both front and rear wheels.

A governing device, responsive to the speed of the locomotive, automatically controls the filling and emptying actions required and the operator of the locomotive has nothing to do with the selection of the hydraulic circuits for driving. This work is done by the control device in such a way that the transmission always operates at the best possible efficiency, entirely independent of the operator's judgment and attention.

The operating liquid, a light mineral oil, is supplied by a small centrifugal pump (g) driven from the primary shaft of the transmission. A set of valves (k) effect distribution of the oil to the various circuits actuated by control device (l). All rotating parts are totally enclosed and are supported in anti-friction bearings. No clutch is required and with the exception of the control valves and bearings, there are no parts subject to wear.

Fig. 3 shows typical efficiency and torque curves for a hydro-kinetic transmission of this type. Efficiency curves (b), (c), and (d) are obtained with converter (b) and couplings (c) and (d) respectively. The curves are plotted against locomotive speed. It will, therefore, be seen that, for starting, the converter is in operation up to approximately 40 per cent of the maximum speed of the locomotive and as soon as this speed is reached, the converter is automat-

Porter Hydraulic Locomotive in switching service on P.R.R. tracks in Pittsburgh



Close-up of the chassis of the Porter Hydraulic Switcher illustrating compactness of this new drive.

ically emptied and couplings (c) filled, which latter remains in operation up to a speed of about 62 per cent. For higher speeds, coupling (d) is filled, effecting power transmission up to full speed. The efficiencies shown are those of the transmission inclusive of gear losses and power for the filling pump.

The Voith Turbo transmission not only makes use of the well-known favorable characteristics of the hydro-kinetic coupling and torque converter permitting stepless and vibration free power transmission, but also combines these basic elements with fixed gear sets in such a way that maximum possible efficiencies and minimum fuel consumption are obtained. The result is, a very compact, extremely economical and completely automatic transmission.

Of importance is the fact that this transmission can be used as a brake to relieve the mechanical braking system. To do this, the Diesel engine is throttled down to as low an rpm. as possible to obtain the maximum differential in speeds between the engine driven impeller and the turbine runner in the torque converter. Thus, the turbine runner acts as an impeller and absorbs the power generated by the locomotive and its load going down grade. The intensity of the braking effect increases as the differential in speeds of the impeller and runner increases and vice versa. It is impossible to lock the driving wheels when using the transmission as a brake. Thus, a load can be held on a grade or allowed to drift down grade slowly by merely throttling the engine.

Of particular importance is the high efficiency of this transmission. Experience over a period of years with this type transmission in service in Europe, Africa and South America shows it to have an overall efficiency of 95 per cent.

Summarizing the principal advantages of the Porter Diesel Hydraulic Locomotive include:

1. The application of power to the drivers is smooth and continuous with the result that a 25-ton unit will start loads that would normally require a steam locomotive of 30 to 35 tons weight.

2. All of the power is transmitted through fluid, thus eliminating friction clutches with their attendant adjustment and maintenance problems, and relieving the Diesel engine of all shocks.

3. The locomotive is very simple to operate. All shifting for speed changes is eliminated since speed changes are made automatically at the most advantageous points.

4. There are no rubbing parts in the transmission and all shafts are mounted on roller bearings. Maintenance is reduced essentially to checking the oil level and to changing the transmission oil periodically.

5. The efficiency of this locomotive is higher than that of locomotives with other types of transmissions.

Although the Porter locomotive is the first one built in the United States using the Voith Turbo transmission, this type of hydraulic drive is by no means new or untried. At the end of 1938, there were, in service or under construction, 558 Voith transmissions aggregating 137,395 hp., the largest unit being 1,380 hp. and the average 246 hp. These transmissions are about equally divided between Diesel locomotives and rail cars and are in use by railroads and industrial plants throughout the world.

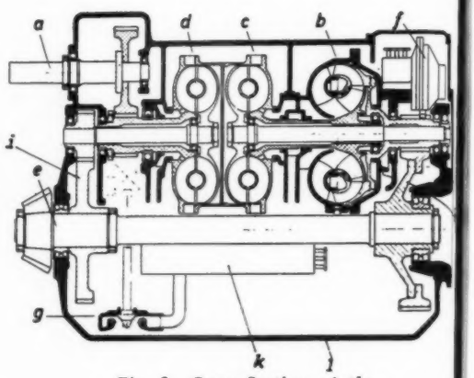


Fig. 2. Cross Section of the Hydraulic Unit.

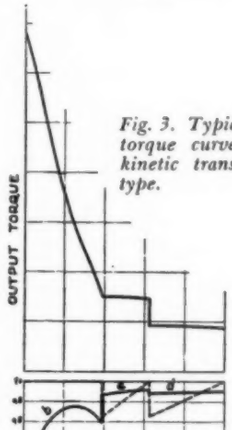
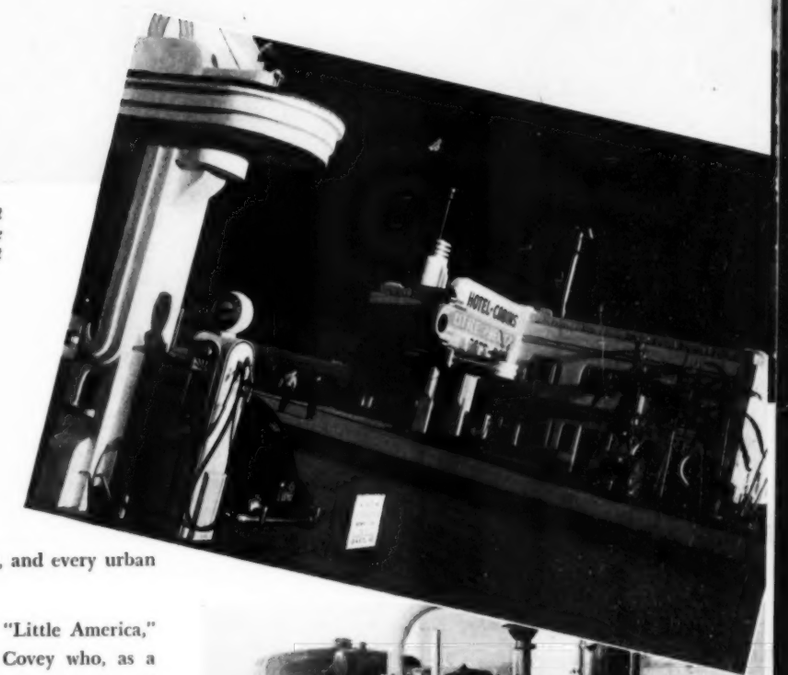


Fig. 3. Typical efficiency and torque curves for a hydro-kinetic transmission of this type.

And so is added another chapter in this intensely interesting book, which time is writing, on the application of torque converters and hydraulic couplings to Diesel drives. The fluid drive offers so many possibilities in this Diesel field that we anticipate many interesting and new applications will become available for publication in the near future. Our January issue will carry details of a 44-ton Hydraulic Switcher.

The continuous output of a Diesel-electric generating set assures weary travelers uniform comfort in this haven on the Wyoming desert subject to extremes of torrid summer heat and deep sub-zero winter weather.



AT THE CROSS ROADS

THERE isn't a more desolate spot in the United States than Granger Junction, Wyoming, on the Lincoln Highway, between Cheyenne and Salt Lake City, Utah. Although the spot has a name, there is no town there. The closest habitation is a cabin fifteen miles west. There are acres of flat, sagebrush-spotted land, and mountainous oucroppings, to make typical Wyoming scenery.

The highway traveler over this route, however, finds a welcome oasis in the form of "Little America," a group of amazingly self-sufficient buildings, belonging to the Covey Gas & Oil Company, and designed to provide impeccable accommodations to tourists.

Many a weary traveler, exhausted from a day of driving through uninhabited, sun-baked or snow-swept Wyoming prairies, is unbelieving at the first sight of this unique establishment. The buildings are ultra modern, white with tile red trim, and streamlined in architectural design. They are spotless, perfectly manicured, and surrounded by a grove of artificial palms, which contrast with the treeless scenery.

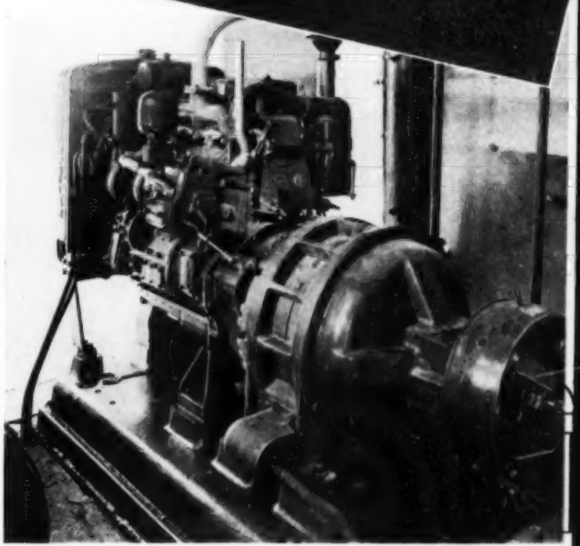
Inside, there is modern service, excellent food, and rooms with inch-thick carpets, tasteful period furniture and tiled baths. There are electric lights, ice cold drinks, and every urban convenience.

Behind the establishment of "Little America," there is the story of S. M. Covey who, as a youth, herded sheep in this dreary portion of the state. Once, caught in a raging storm, he was forced to "lay out" all night on the exact spot where "Little America" now stands. With the wind at 50 mph., and the temperature at 40 degrees below, he vowed that some day he would build a shelter in this lonely spot.

Many years later he went back to the cross road, but this time he took with him an army of dollars, architects, carpenters, and interior decorators. When they left the spot, there stood a lodge, a hotel and cabins, and supply building.

For power, Mr. Covey naturally enough chose a Diesel engine, as purchased power was not available to him in this isolated spot. He installed a Caterpillar Diesel engine, direct connected to a 30 kw. General Electric generator, and set it to work driving all machinery, and providing all lights for the settlement.

Out in the desert, this unit must run both night and day, being shut down just briefly for oil changes. It is the only source of electrical supply the settlement has, and has run more than 9,000 almost continuous hours without an unscheduled shutdown. Since it was installed in 1938, accurate records show fuel consumption has averaged one and two-thirds gallons an hour.



The new Atlas Diesel-powered towboat, "Nicholas Duncan," on her maiden voyage from Point Pleasant, West Virginia, to La Salle, Illinois.

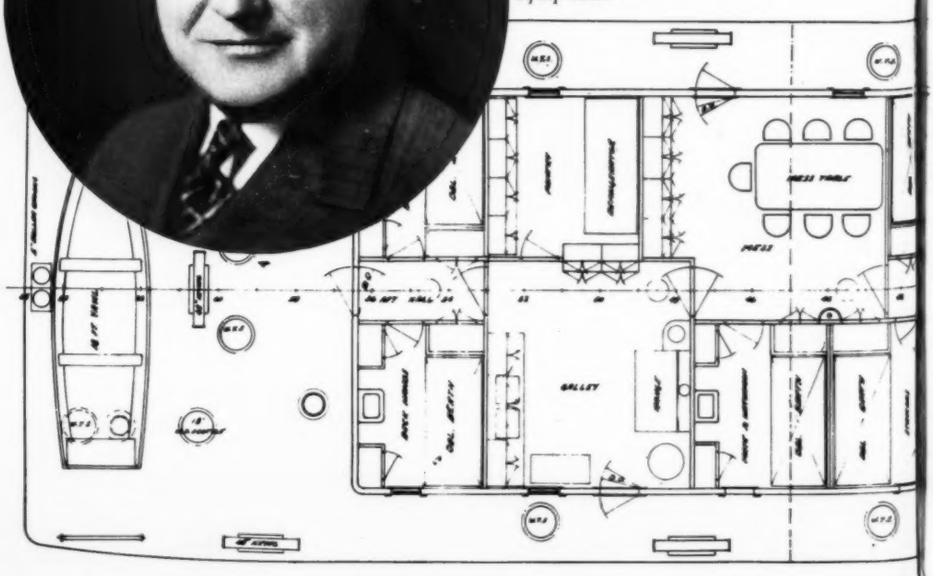
NEW RIVER TOWBOAT "NICHOLAS DUNCAN"

By OTIS A. SIBLEY

NINE years ago the Marquette Cement Manufacturing Company inaugurated river towing of bulk cement with special self-unloading hopper barges and a new Diesel towboat, the *William Dickinson*. Subsequent service has more than justified this forward step in marine transportation initiated by Mr. Walter A. Wecker, President of the Marquette Company, and ably executed by Captain John Luchow, his Marine Superintendent, and this towboat soon proved to be one of the most profitable of her type on the entire river system. On the proven basis of minimum operating and maintenance costs and maximum availability for service, it was decided to extend towing activities along similar lines. Owner satisfaction with the first ship was clearly demonstrated when Mr. T. R. Tarn, naval architect, the Marietta Manufacturing Company, builders, and the Atlas Imperial Diesel Engine Company, who supplied main propulsion engines, were once more awarded their respective responsibilities when the second vessel was ordered. After thorough and highly successful trials on the

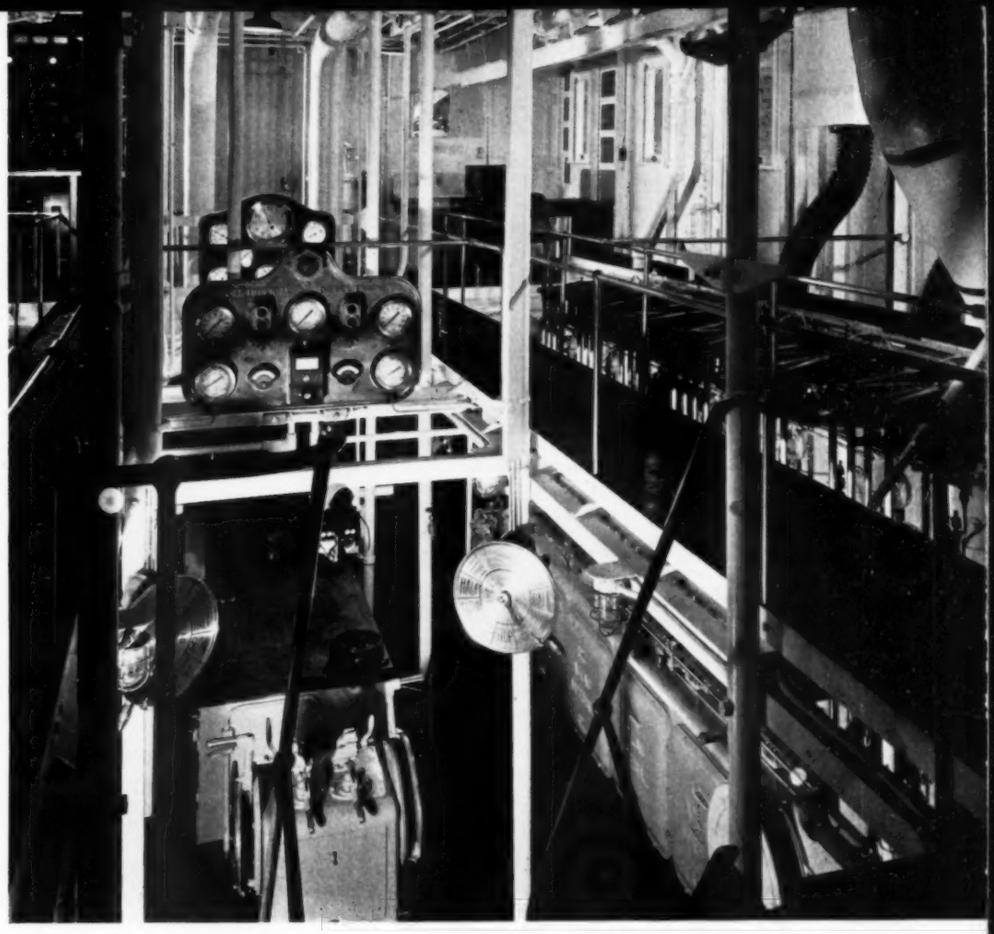
Mr. W. A. Wecker, President of the Marquette Cement Manufacturing Company, who inaugurated river towing of bulk cement. The "Nicholas Duncan" is his company's second Atlas Diesel-powered towboat.

Plan drawing, showing general arrangement of machinery, quarters, and deck equipment.



Ohio River, the new *Nicholas Duncan* was recently commissioned and proceeded immediately with a tow to Cape Girardeau, Missouri, and La Salle, Illinois, where the Marquette plants are located, the latter being the largest individual cement plant in the United States.

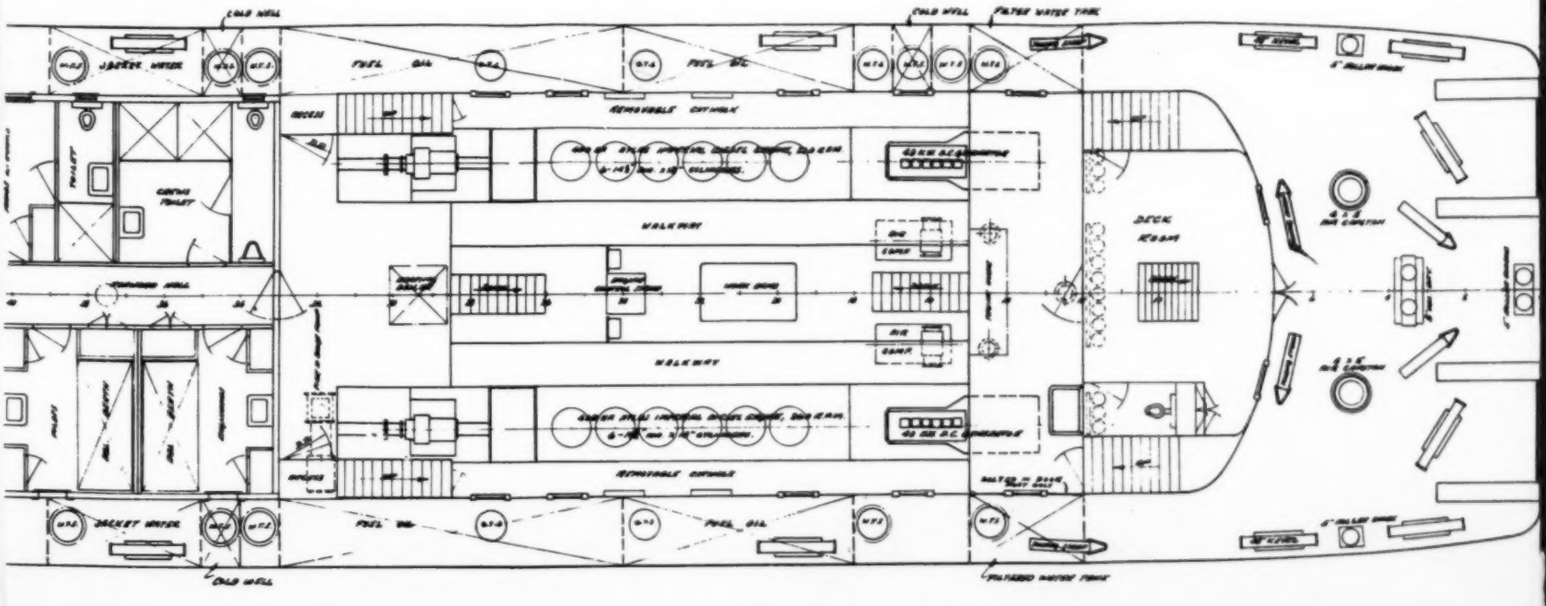
Because of many innovations and advances in design and construction the plans and specification of the *Nicholas Duncan* were copyrighted. Perhaps the most progressive departure from accepted shipbuilding practice is the total absence of deck crown and curvilinear sheer, and in its stead Mr. Tarn has used what he terms a "straight line sheer." As the exterior views and the profile plan show, all decks are perfectly flat and straight, sloping aft with a total difference in height between bow and stern of approximately two feet when the ship is on an even keel. The advantages of a more satisfactory length-depth ratio, resulting in greater girder strength and economical construction, are obvious. Water from the topping readily drains through port and starboard scuppers as it progresses aft. The *Nicholas Duncan* has a welded steel shell attached to a steel frame. It is a twin tunnel screw, river towboat having the following principal dimensions: Length, molded 130 ft. 0 in.; beam, molded 28 ft. 0 in.; mean draft loaded, 6 ft. 0 in.; and an average depth of 9 ft. 3 in. Displacement in service condition is 500 short tons. The forward body of the hull has a flat rake terminating in a square headbeam, rounded at the outboard corners, with faired sides; and appended forefoot with rounded stem and rounded bilges. The afterbody has a square transom with faired sides and rounded corners and bilges. The underwater portion has a flat rake, the extension of which forms shallow tunnels and divisions abreast the propellers to provide air seals for the propeller chambers. The hull is framed transversely and fitted with longitudinal and transverse oil-tight and watertight bulkheads. The entire superstructure is



View from upper engine room of "Nicholas Duncan" looking forward, showing the 400 hp. starboard Atlas Imperial Diesel. Weston tachometers and an Alnor pyrometer may be seen on the central instrument panel above the control station.

riveted construction with local welding for weather tightness. The ship is classified by the American Bureau of Shipping for Class A River Towing Service and certificated by the Bureau of Marine Inspection and Navigation, and carries a crew of thirteen: the Master, Captain Luchow, Chief Engineer and three assistants, four deck hands, two cooks and two pilots.

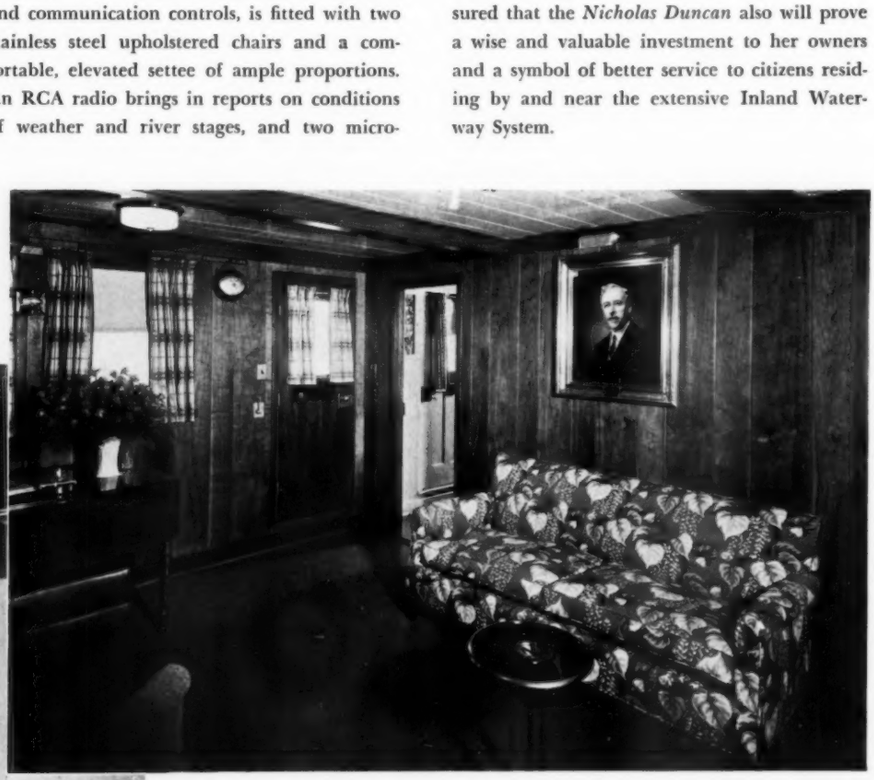
Main propulsion machinery consists of two, 6 cylinder, 4 cycle, direct-reversible, Atlas Imperial Diesel engines rated at 400 hp. each at 240 rpm. Engines, sailing clutches and Kingsbury thrust bearings are mounted together on integral bedplates. Main engine mounted auxiliaries include Coppus air filters, Purolator lube and fuel filters, Tuthill lube oil pump, Weston electric tachometers, Maxim spark arrester-silencers, Alnor exhaust pyrometers, Viking Safety Controls, and American Hammered piston rings. Closed jacket water cooling systems of Condenser Service & Engineering type are employed. Starting and maneuvering air is supplied by two Gardner-Denver vertical compressors. Likewise, fuel and lubricating oil for both are purified by two



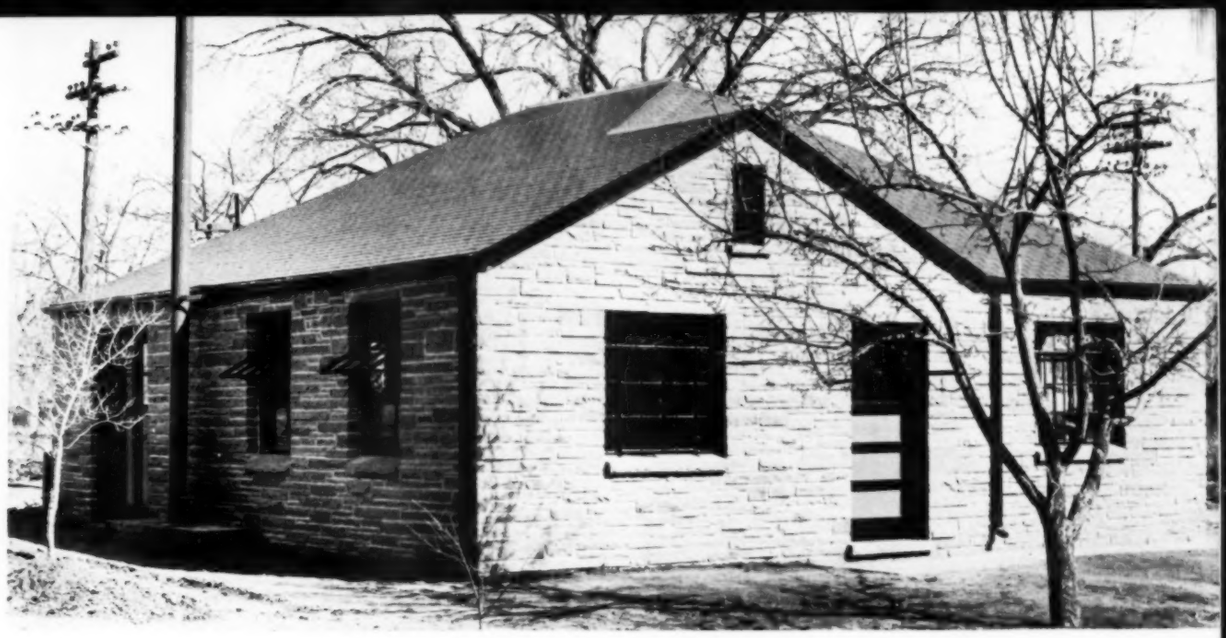
Goulds Hydroils, which operate on the continuous or batch system as desired. Two Wright navy-type hoists on a single "U" track also serve both units for routine maintenance and inspection of heavy parts. For auxiliary power, two 40 kw. Fairbanks-Morse Diesel generating sets are installed on Korfund steel spring Vibro-Isolators to dampen the natural frequencies induced by 1,200 rpm. rotative speed. Two 24 volt Exide batteries furnish current for starting, the emergency lighting system and Viking Safety Controls. Both F-M engines are fitted with Burgess air filters, Reliance tachometers, Alnor exhaust pyrometers, Maxim silencers and Fulton-Sylphon Safety Controls. Miscellaneous engine room equipment includes a Cleveland Switchboard Company switchboard, Goulds pumps for raw water, jacket water and fuel transfer, Lux fire protection system and a Crane oil-fired heating boiler. All pumps are motor-driven. Propeller shafts are 8 in. in diameter and connect to 7½ in. line shafts supported by SKF steady bearings. Tail shafts are carried by Goodrich Cutless Rubber Bearings. The Ferguson cast steel four blade propellers have a diameter of 75 in. and a pitch of 63 in. and are balanced both statically and dynamically and are stainless steel fitted. There are two rudders for each propeller; one mounted aft and the other forward of each wheel, and designated as steering and flanking rudders, respectively. These are controlled by convenient levers in the pilothouse, which actuate the special hydropneumatic steering gear. The hydraulic action is automatically supplemented by the pneumatic in case of emergency. Expert maneuvering in swift river currents around sharp bends calls for prompt and powerful rudder action. This system was developed and patented by Mr. Tarn and is particularly efficient in its action. To negotiate a turn with minimum radius, the port and starboard rudders are opposed and the direction of engine rotation is changed so that one is running "ahead" and other "astern." A strong couple is thus induced that is far superior in turning force to the conventional rudder arrangement. In a narrow and tortuous channel with barges ahead loaded with 5,000 tons of cargo, the advantages of this design are obvious. In this regard, as well as on other points too numerous to mention, Mr. Tarn has demonstrated his expert knowledge and wide experience with river craft and their many peculiarities of service. Since he represents the third generation of a family engaged in river activities, the success of this ship and that of the *Dickinson* are easily understood. These vessels also reflect most creditably upon the Marietta Manufacturing Company, builders, who faithfully executed Mr. Tarn's designs.

From the foregoing it is apparent that intelligent spending has not been spared to make this towboat the finest of its kind on the rivers. Its mechanical excellence is equalled only by its appointment of quarters. The pilothouse, in addition to the usual navigation and communication controls, is fitted with two stainless steel upholstered chairs and a comfortable, elevated settee of ample proportions. An RCA radio brings in reports on conditions of weather and river stages, and two microphones (fixed and portable), connected to a directional loudspeaker, enable the pilot or Master to communicate with deckhands on the barges, engineers at the numerous locks, passing vessels, etc. Electrically operated Carlisle-Finch searchlights, Kirk-Harbicht engine room telegraph, ship's telephone, Kelvin-White binnacle and mirrors that reflect activities on the forward deck permit complete control for maximum safety and efficiency at all times. Wide-vision windows give 360 degree visability. Directly below is the Officers' Lounge, which is tastefully appointed and completely panelled with polished walnut. Antique bronze fittings lend much to this interior. An oil painting of Nicholas Duncan, chairman of the board of directors of Marquette until his death in 1927, is carried on the after wall. The master's and owners' staterooms adjoin this yachtlike lounge. Below, on the weather deck and aft of the engine room are seven double staterooms, showers, locker space, galley and mess-room, all unusually well-equipped and convenient for use. All decoration was under the personal supervision of Miss Gertrude Stanton, A.I.D., interior decorator, of Chicago. Small details have received so much expert attention that the casual visitor may be pardoned if he inquires whether this is a towboat or a showboat. With all of the comfort and unusual furnishings, however, one has only to remember the profitable record of the *William Dickinson* to be assured that the *Nicholas Duncan* also will prove a wise and valuable investment to her owners and a symbol of better service to citizens residing by and near the extensive Inland Waterway System.

Officers' lounge with oil painting of Nicholas Duncan, for whom this new towboat was named.



Mr. T. R. Tarn, experienced river naval architect, at the controls of the Atlas Diesel-powered "Nicholas Duncan," which he recently designed for the Marquette Cement Manufacturing Company.



This attractive building houses the Lyons, Colorado, Diesel electric generating plant as well as the engineer and his family.

LYONS, COLORADO

By GEORGE D. CROSSLEY

NESTLED in the Colorado hills, which rise to nearby Estes Park, is the city of Lyons where we find Diesel-electric light and power under municipal ownership have proved both economical and dependable over a period of three years. Up to 1936, Lyons purchased electricity from Longmont, Colorado, the nearest large city. Since then a modern, city-owned generating plant, housed in a stone building designed to fit its surroundings, has been supplying Lyons' electrical needs.

Two Model L, 3-cylinder Cummins Diesel engines are Vee-belted to General Electric 50 kw. alternators. Engine and generator pulleys are sized to step up engine speed of 650 rpm. to 1,200 rpm. at the generators. Current is generated at 2,300 volts and is distributed at 100-220 volts. The three-panel switchboard carries General Electric instruments including two DC ammeters, two AC ammeters, one frequency meter, one voltmeter, two carbon pile voltage adjusters, and two synchroscopes for automatic maintenance of phase between the engines.

The output of this plant has doubled within the first two years. Peak loads have increased 12 kw. per year. Total operating time in three years for one engine was 14,518 hours, for the other engine 14,054 hours. In that time, both engines consumed 75,588 gallons of Diesel fuel, or 2.645 gallons per hour. Total lube oil consumed was 2,697 gallons, or an average of .0873 gallons per hour.

The well-kept engine-room of the Lyons, Colorado, municipal light and power plant. Note General Electric switchboard, rear, and Curtis starting air compressor, right.

GARLAND, TEXAS

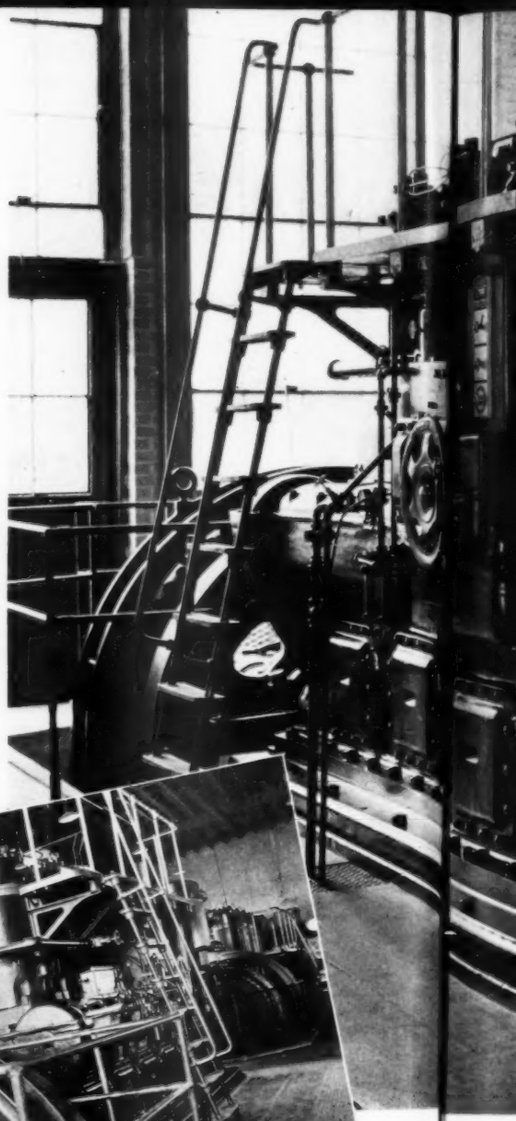
By ORVILLE ADAMS

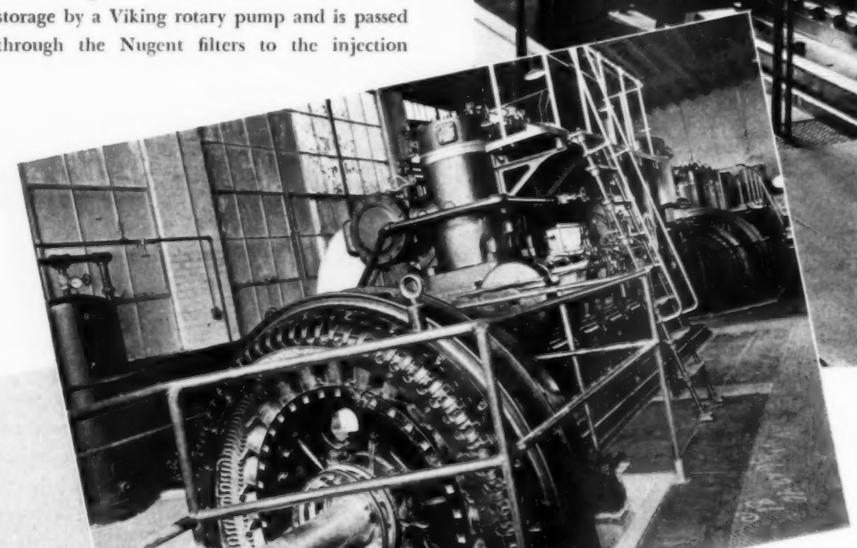
THE city of Garland, Texas, has just completed the installation of a new Fairbanks-Morse Diesel in its municipal light and power plant, this being the fifth Diesel generating set to be bought by this city since the first 75 hp. semi-Diesel was started up in April, 1923. Garland, located fifteen miles northeast of Dallas, is a residential town whose citizens have sponsored the proposition of "Home Owned Utilities" for more than sixteen years.

The new Fairbanks-Morse Diesel is a Model 33-D-14, five cylinder unit, with pump scavenging and oil-cooled pistons. It has a bore and stroke of 14 in. x 17 in. and at 300 rpm. is rated at 575 hp. The engine is direct-connected to a 490 kva. Fairbanks-Morse alternator with a V-belt driven exciter. The installation represents the best in current Diesel practice, comprising a full complement of auxiliaries and accessories and good practical engineering.

The chief accessories, installed with the engine, include an Alnor pyrometer, with the instrument mounted on the wall board adjacent to the engine on the operating side, where also are found the pressure gauges for water, fuel, and lubricating oil, together with the scavenging air pressure gauge, and an alarm system. A Marley cooling tower handles cooling for the entire plant. Water lines throughout the plant are equipped with Crane valves.

The fuel injection system, including a Nugent fuel oil filter, is controlled by means of a Woodward governor of the prime mover, isochronous type, mounted directly adjacent to the fuel injection pumps on the operating side of the engine. Fuel oil is transferred from storage by a Viking rotary pump and is passed through the Nugent filters to the injection pumps where it is further cleaned by strainers and filters.

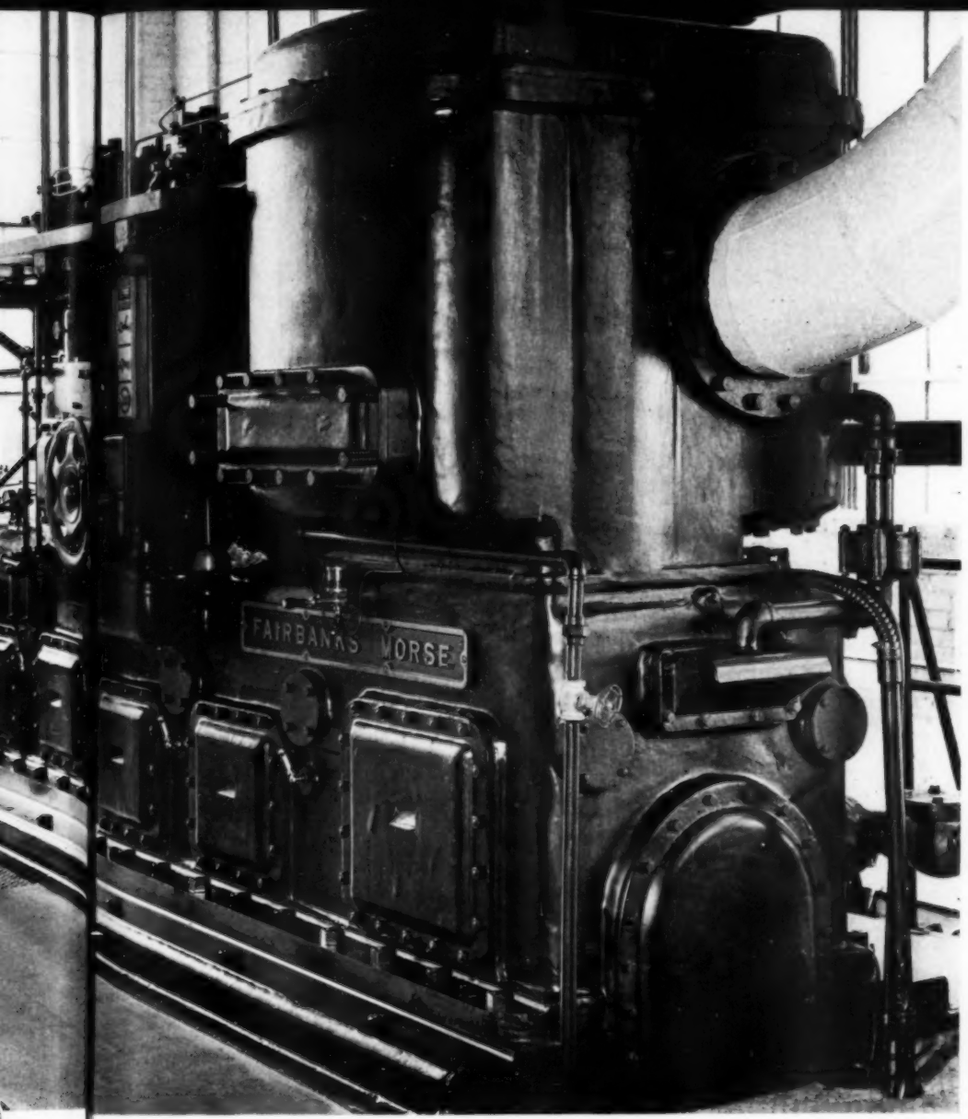




View of the generator end of the new Fairbanks-Morse Diesel.

Both power plant and water works are municipally owned in Garland, as indicated by the water tank towering above the power plant buildings.

Lubricating oil is filtered by a Briggs Oil Clarifier, which includes two units and a reservoir for make up oil, the reclaiming process being continuous. The circulating oil for piston cooling is passed through a Schutte & Koerting oil cooler located near the clarifier. Reclaiming and cooling apparatus for the lubricating oil, as well as the make up reservoir and transfer pumps, is located in a pit compartment on the exhaust side of the engine accessible by steps down from the engine room floor, the equipment being below the crankcase level.



Operating side of the new engine with Woodward governor showing in the center.

The Maxim exhaust silencer is connected to a horizontal header which is fully insulated between the silencer connection and the connection to the water cooled engine exhaust manifold. Regular pipe insulation is used on the exhaust header.

The Maxim intake silencer is likewise mounted horizontally between the air intake manifold connection at the scavenging pump and the American Air Filter battery outside the building, adjacent to the exhaust silencer and stack. Air enters the filters, passes through the intake silencer, and goes directly to the scavenging cylinder, properly cleaned and silenced.

The switchboard and switchgear is General Electric equipment, and was remodeled to include a dead front design and a new panel for the new engine. A Westinghouse recording meter and a master clock are mounted on the board. All other switchboard instruments are General Electric, and the installation is standard for this type of equipment.

The profits earned by the plant during the last ten years have been used to make important improvements and have contributed to a number of developments that marked the progress of this community during this period. Starting out with barely sufficient customers in sight to justify the operation, the city plant now handles 95 per cent of the light and power load in the city, with the private utility which still maintains an office and transmission lines holding on precariously to the other five per cent of the business. The new plant was built on revenue bonds, with no aids or grants required, the plant having always earned its way.

Accurate records of operation and maintenance, as well as income and expenses, have been kept for many years. The record speaks for itself, and only a summary is included here to indicate the possibilities for even greater profits, now that the new engine, with its improved fuel economy, has replaced semi-Diesel operation. The plant is now generating at a rate in excess of one million kilowatt hours per year. For the past year, the record was:

Total kilowatt hours generated	939,300	
Deduct Street Lighting	62,032	
Water Pumping	132,200	
Other city uses	28,463	
Station losses and uses	109,010	
Revenue current and sold to consumers		606,615 kw-hrs.

Since no charges were made for street lighting, water pumping, and other city losses, this considerable item of non-revenue current must be considered an important addition to the actual net profit. The cost of operation and maintenance, including the purchase and replacement of motors and pumps, is summarized as follows:

Production Costs	$10,157.52	
Distribution Costs	4,709.80	
Total Costs		$14,867.32

The gross receipts from the sale of 606,615 kw.-hrs. was $23,640.16, giving a profit of $8,772.86, after deducting the total cost of production and distribution of $14,867.32. Calculation shown indicates the kilowatt hour costs as follows:

Production Cost per kw.hr.	$.0109	
Distribution Cost kw-hr.	.0050	
Total Production Cost kw.-hr.		$0.0159

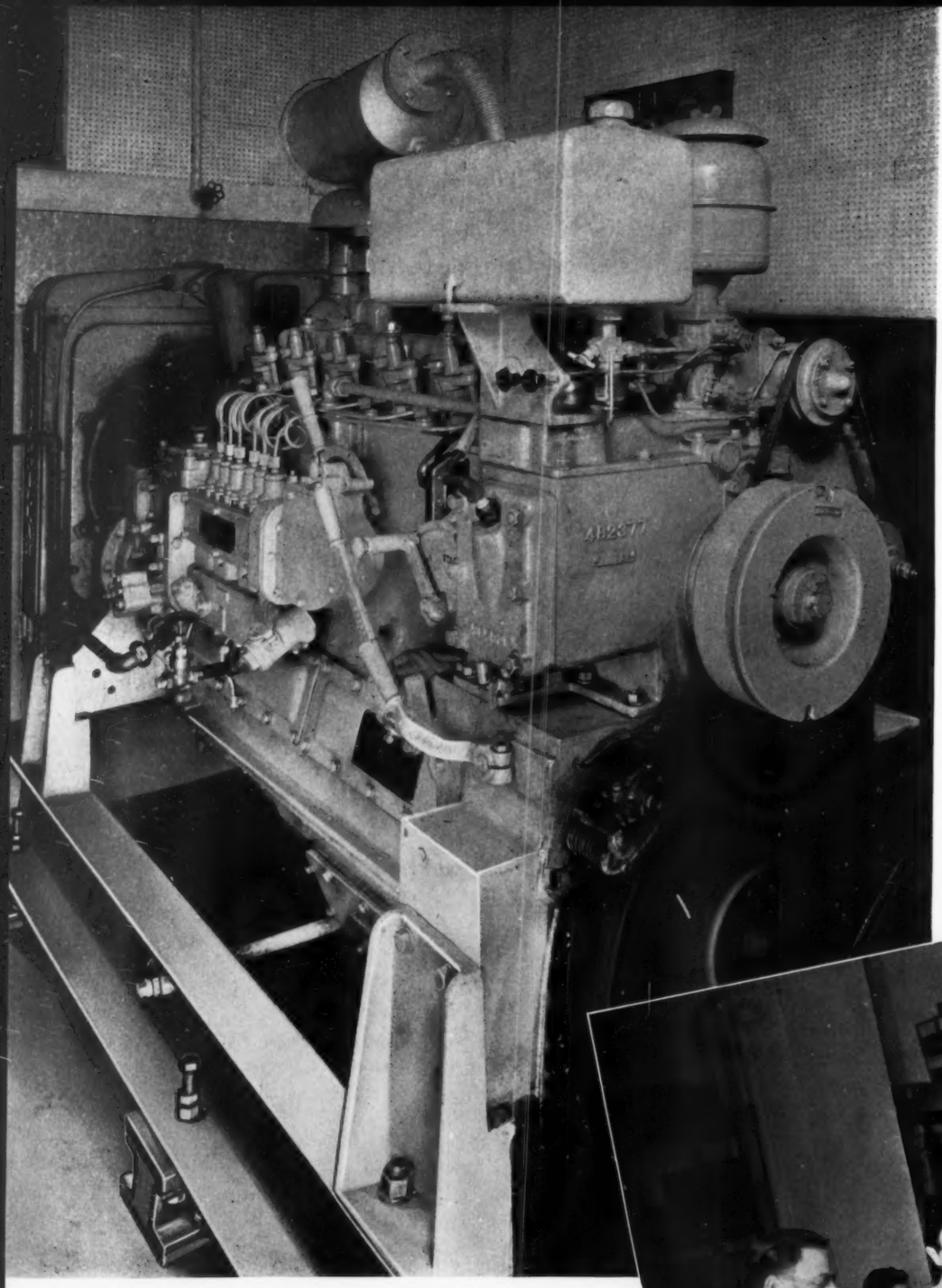
The fuel and lubricating oil consumption compares favorably with experience as is summarized as follows:

Kw.-hrs. per gallon of fuel 9.
Fuel and Lubricating Oil Cost per kw.-hr. .00519.

At the present time lighting and a considerable industrial motor load make up the demand for current, giving a range of load from a minimum of 160 kw. to a maximum of 420 kw. There are approximately 420 connections or meters, yielding an average of $20.75 per meter, a figure that is in line with the records of a score of plants of this size recently studied.

The fuel oil used is a straight gas oil of 32-36° known as Gainesville, Texas Gas oil, and is furnished by the Sharps Refinery. It has a flash point of 235° F. and a fire point of 265° with a 20° F. pour point. Fuel is passed through Nugent filters to remove foreign matter and suspended solids.

Mr. Charles Newman, Superintendent of the Light Plant for the City of Garland, states that since the installation of the new 575 hp. engine, they have been able to improve the economy of operation considerably, as they are now securing 11.75 kw. hours per gallon of fuel. This is an average for the plant and compares with the 9 kw. hours per gallon which they previously obtained.



The 6 cylinder Caterpillar Diesel and 30 kw. Star generator recently installed on the fourth floor of 895 Broadway, New York City. Korfund steel spring isolators may be seen under the integral sub-base, and made this installation possible on a wooden floor by eliminating all vibration transmission. It is impossible to tell whether the engine is running or not from the floors above or below.

BUCKET F

THE two outstanding characteristics of the Diesel engine, its unparalleled economy and dependability, easily account for the universal acceptance of this type of power by every conceivable industry. Many manufacturers, however, who stand to profit materially by reduced electric rates have hesitated to consider a Diesel-generator installation because of local conditions resulting from plant location. Until recently, this was the case with Levin & Rosenberg, Inc., 895 Broadway, New York City, manufacturers of buckles, buttons, and other novelty stampings. For some time it had been obvious to Mr. Goldman, Chief Engineer, that Diesel-generated power would cut his company's costs for this item by as much as sixty percent, but the shop is located on the fourth floor of a brick building with wood floors that permit a maximum loading of only 125 lbs./square foot, and even a small motor-driven air com-

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Diesel Reduces Power Costs For Novelty Stamping Manufacturer on Fourth Floor of Loft Building

ET OF BUCKLES

pressor caused considerable vibration. However, the savings offered by a Diesel were so substantial that Mr. Goldman persisted in his investigation and eventually laid his problem before Mr. N. Schafler, Engineer of the Atlantic Heat & Power, Inc. Their practical and highly successful solution not only made Diesel benefits available to this organization, but point the way for literally thousands of similar concerns to enjoy comparable savings regardless of local conditions.

The engine selected to satisfy weight conditions is a 6 cylinder Caterpillar Diesel turning at 1,200 rpm. and directly connected to a 30 kw. Star Electric generator. Since the natural operating frequency of this or any other reciprocating unit would transmit sufficient vibration to preclude its use on the existing wood floor structure without proper isolation, the treatment of this foundation problem is of particular interest. Floor boards were covered with a layer of special impregnated cork, onto which was poured a ½ inch slab of concrete. This was covered with a Korfund cork mat, and a sheet steel plate was laid as the foundation surface. The final step in vibration control was to isolate the common steel sub-base of the engine and generator with eight Korfund steel spring Vibro-Isolators as shown in the illustration. Since these precision units are subject to easy yet critical adjustment at any time, the owners have guaranteed protection throughout the entire useful life of their plant. Obviously, this degree of perfection of modern resilient mountings removes the one remaining major obstacle to Diesel installations presented by difficult building conditions. Also, since approximately 75 per cent of machinery noise is structure-borne, Korfund serves the additional purpose of removing any possible objections from other tenants along this line. Engine room soundproofing and a Burgess exhaust muffler completed satisfactory silencing. In fact, it is impossible for tenants above or below to tell when the engine is started or stopped.

Since this company is somewhat cramped for space, it was necessary to convert a lavatory to serve as an engine room. This measures no more than 5 by 13 feet and represents no sacrifice compared with the total of 15,000 square feet of total floor space occupied. Also, no increase in personnel was necessary because the Diesel requires practically no attention except for one hour each Saturday when lubricating oil is changed and the plant is checked after shutting down for the week-end. It operates continuously from 8:00 o'clock Monday morning to 3:00 P.M. Saturday, fifty-two weeks per year. Except for filling the fuel oil day tank each morning from the storage tank in the basement, no one pays any attention to the Diesel. Safety controls on lubricating oil pressure and jacket cooling water temperature provide ample warning in the event of any irregularities that might possibly occur in operation. The fuel and lube oils used in this installation are Paradiesel, products of the Paragon Oil Company of New York City.

Average power demand is 20 kw. or only two-thirds of plant capacity, and this is divided between light and power in the ratio of approximately three to two. The company maintains a well-equipped machine shop for making dies and special equipment and operates several large power stamping machines, also isolated by Korfund anti-vibration products.

Another important advantage attendant to the installation of this Diesel is the improved heating now available at night when regular building heat is lowered. A system of engine jacket water heat recovery and special radiators makes possible a night temperature thoroughly comfortable for employees and also affords protection to the valuable stocks of patent leather maintained in inventory. Water is taken from the engine at 180 degrees F., circulated and returned at 140 degrees. Shop conditions in the summer months are also improved by the air intake system of the engine and during the hot weather the floor is actually cooler with the new engine than it was without it.

Mr. Sam Levin is most enthusiastic about this Diesel plant, which originally no one thought was feasible. It will have paid for itself out of savings within two years, and the reduction in electric bills will then become clear profit. His competitors will have to make a lot of extra buckles to overcome the new advantage of this progressive executive. When asked about moving to larger quarters, which will soon be necessary, Mr. Levin expressed no more concern about moving his Diesel than any of his other machinery. After all, it was brought up in the building elevator.

Reading from left to right: Mr. Sam Levin, Production Manager, Mr. Goldman, Chief Engineer, and Mr. Sol Levin, a partner of the firm, inspect a few of the millions of buckles that they produce annually. They expect to pay for their new Diesel within two years out of power savings, after which the substantial difference in electric charges will be clear profit.

A section of the complete machine shop maintained by Levin & Rosenberg, Inc., for making their own special dies. Power for this and other machines, as well as a large lighting load, is now economically supplied by their new Caterpiller Diesel.

DIESEL AVIATION

A Junkers Ju 52 "flying test stand" with two B.M.W. 132 gasoline engines in the wings and a Junkers Jumo 205-D Diesel in the nose.

FLIGHT TESTING DIESEL AIRCRAFT ENGINES

By PAUL H. WILKINSON

BEFORE a Diesel aircraft engine can be placed even in small series production for civil or military purposes, it has to pass exhaustive tests both on the ground and in the air. During the initial stages of development, the tests usually are carried out on a single-cylinder engine embodying most of the features which subsequently are to be incorporated in the complete power plant. Constructional changes which are deemed necessary can then be incorporated without great difficulty so that when the complete engine is built, only minor changes are necessary.

Testing of the complete engine is carried out in accordance with the requirements of the government department from which a certificate of approval is desired. Ground testing involves setting up the engine on a test stand and running it for various periods of time and under varying conditions of load. No difficulties are encountered in observing the performance of the engine and in recording its performance data on the ground. After the certificate of approval has been issued, however, there remains the question, "How will the engine behave when it is in the air?"

In the early days of flight testing a new engine, it was customary to install it in a single-engined airplane. The observer who was carried to check the engine performance, did so to the best of his ability but due to limited space and lack of assistance, complete instrumentation could not be obtained. If trouble occurred and the engine developed excessive vibration or noise or decrease in rpm., the pilot immediately had to decide whether to make a forced landing or further endanger the condition of the engine by continuing until a good landing field was in sight. When landing, it was sometimes necessary for the pilot to speed up the troublesome engine to clear an obstacle and this again sometimes resulted in complete breakdown of the power plant. Even after the landing had been safely accomplished, there remained the difficulty of accurately determining the cause of the trouble.

This arrangement did not prove to be very satisfactory and consequently twin-engined airplanes came to be used for the flight testing of new engines. These larger planes permitted the interior of the cabin to be fitted up properly and an adequate crew of observers to be carried to check the performance of the engine under various conditions of flight. Junkers equipped one of their Ju 86 airplanes in this manner so that it constituted a flying test stand. There was disadvantage, however, that if the engine under test gave trouble or stopped, a severe load was immediately imposed on the remaining engine and a forced landing still might have to be made.

Ultimately, it became obvious that the ideal arrangement for a flying test stand was a three-engined airplane in which the test engine could be installed in the center nacelle. In the event that trouble developed and the speed of the test engine had to be reduced or it had to be shut down, the two outboard engines could then take up the load evenly between them. This arrangement enabled the test engine to be run at various throttle positions

The fire rings are carefully inspected before assembly and after tests.

The measuring and recording room on a Junkers Ju 52 "flying test stand."

and by throttling the outboard engines, the test engine could be run under different conditions of load. The psychological effect upon the crew was also better since the possibility of a forced landing was very remote.

The Junkers Ju 52 three-engined flying test stand, which is illustrated in this article, primarily was developed for the flight testing of Jumo 205 Diesel engines and for comparing their performance with that of gasoline power plants. It will be seen that the cabin is particularly well equipped with instruments for observing the performance of all three engines so that accurate comparative data can be obtained. All of the important characteristics of the engines can either be read directly from the large dials of the instruments or obtained by working the controls. Extensive test flights can be undertaken with this type of airplane as the pilot and co-pilot only have to devote their attention to flying while the observers record the engine data which is required.

Junkers have submitted numerous Diesel aircraft engines to long test flights on their Ju 52 flying test stand and one of their experiences with a Diesel of the high-altitude type is worthy of note. The engine in question was a new development equipped with an exhaust-driven supercharger and although it caused trouble, thanks to the fact that the engine could be shut down promptly, comparatively little time was lost. Eleven times, piston seizing and breakage in this high-speed Diesel were avoided because the trouble could be detected in its initial stages. Each time, the damage caused to the engine was so trifling that the test flights could be resumed in a few days.

This method of test flying new types of engines has a good deal to recommend it and it could be put to good use in the United States. Although we do not have any large all-metal, three-engined airplanes suitable for the purpose, doubtless they could be manufactured by some enterprising firm.

Amply powered by Diesel propulsion and generating engines, and water-tight, the "Eureka" is ready for come-what-may in off-shore cruising.

"EUREKA"

By WARREN GLEASON

ONE of the most interesting and unusual Diesel yachts built in recent years is the glittering new *Eureka,* which was designed and recently completed by Higgins Industries, Inc.

This little beauty is forty-two feet long overall with a beam of twelve feet, and is decidedly a sturdy, off-shore cruiser. Yet, through the design of the spoon-bill bow and the Eureka-model bottom construction with the semi-tunnel stern, this yacht may be landed on any river-bank or beached through the surf on any shore without damage to underbody or propeller.

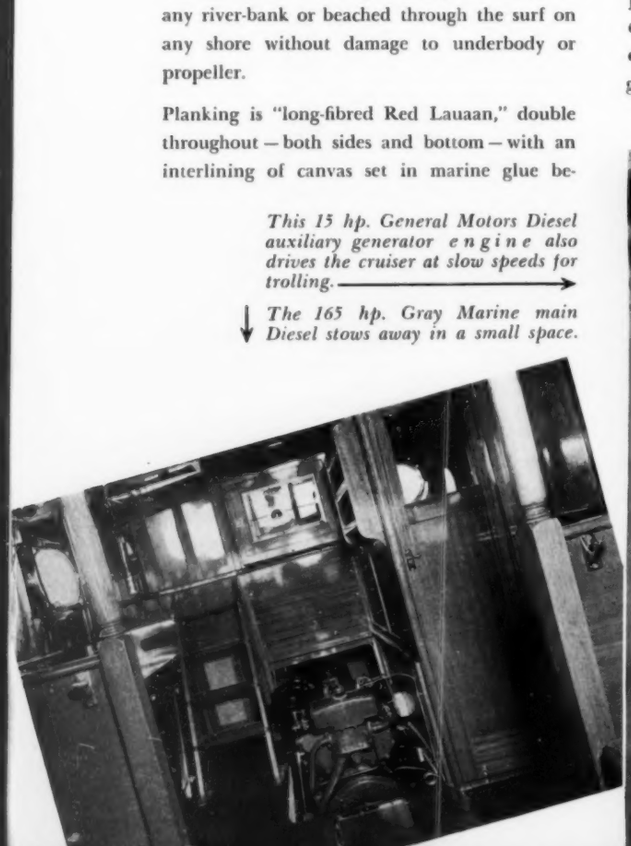
Planking is "long-fibred Red Lauaan," double throughout — both sides and bottom — with an interlining of canvas set in marine glue between the layers, a type of construction covered by U. S. patent No. 2,163,998. All windows, which are the heaviest type of port-lights, can be made positively water-tight. Sea after sea could break entirely over the craft without a drop of water being shipped.

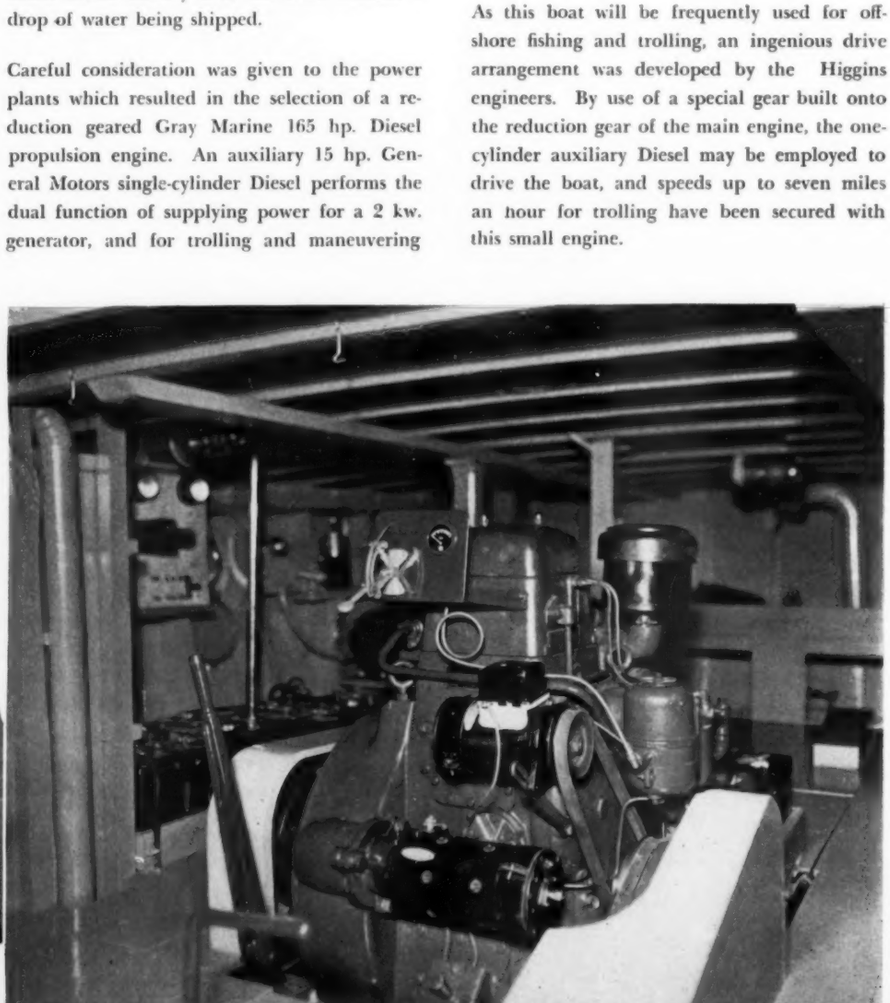
Careful consideration was given to the power plants which resulted in the selection of a reduction geared Gray Marine 165 hp. Diesel propulsion engine. An auxiliary 15 hp. General Motors single-cylinder Diesel performs the dual function of supplying power for a 2 kw. generator, and for trolling and maneuvering propulsion. This generator is unusual for this size of craft but, as much electrical equipment is installed, a large-capacity generator is quite in order.

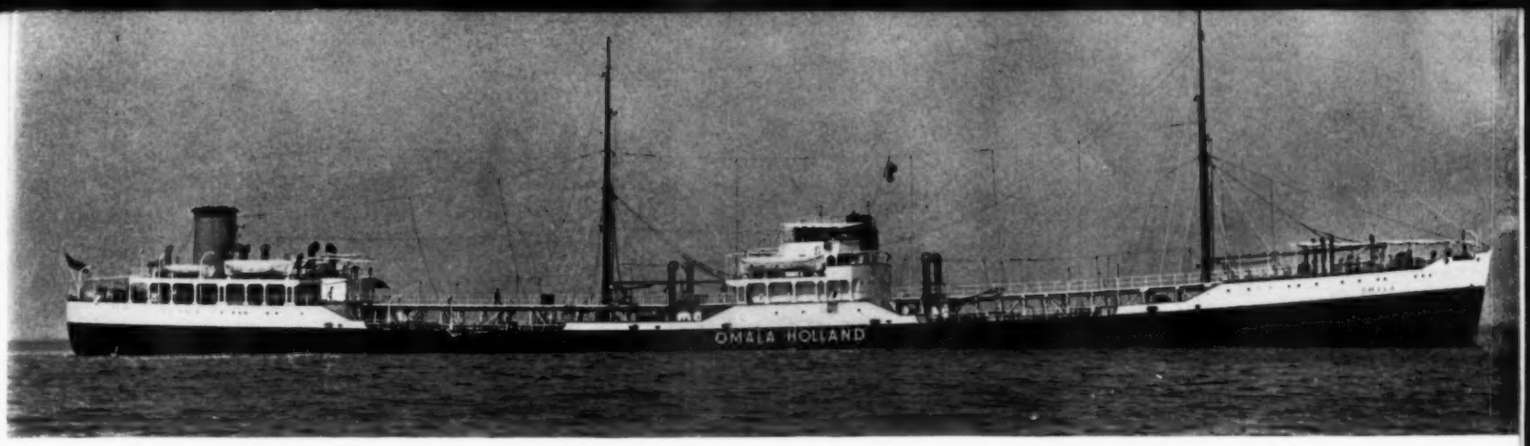
As this boat will be frequently used for off-shore fishing and trolling, an ingenious drive arrangement was developed by the Higgins engineers. By use of a special gear built onto the reduction gear of the main engine, the one-cylinder auxiliary Diesel may be employed to drive the boat, and speeds up to seven miles an hour for trolling have been secured with this small engine.

This 15 hp. General Motors Diesel auxiliary generator engine also drives the cruiser at slow speeds for trolling. →

↓ *The 165 hp. Gray Marine main Diesel stows away in a small space.*







This Anglo-Saxon Petroleum Company's tanker is equipped with a Werkspoor type four-cycle Diesel engine.

ITALIAN DIESEL TANKERS

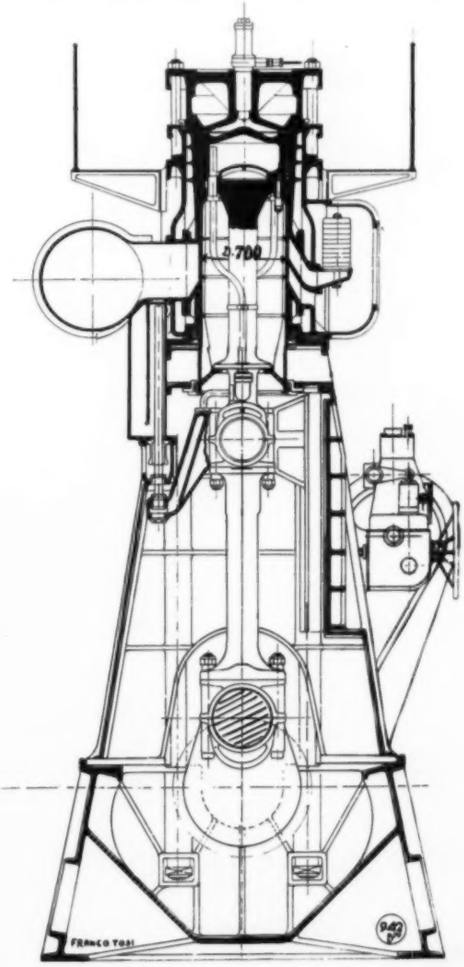
By ANTONIO GIORDANO

ITALIAN Diesel engine builders have been very active in the course of the past few months in building the propelling machinery for tankers. In the first place, the uninterrupted increase in the imports of crude oil and petroleum products into Italy, which has grown from an average of 300,000 tons before the War to 3,662,206 tons in 1937, has raised for Italy the problem of building her own fleet of tankers. In the second place, in the course of the past few years Italian shipyards have secured important orders for tankers from foreign shipowners and, after the *John A. Brown*, built by the Cantiere Monfalcone of the Cantieri Riuniti dell'Adriatico for the Standard Oil Company of New Jersey, and the *Adinda* and *Omala* for the Anglo-Saxon Petroleum Company, orders have now been placed for three 10,500 ton d.w. motor tankers by the Mexican Government from the Ansaldo Shipbuilding Co. at Genoa Sestri, and for one tanker of 10,500 tons d.w. ordered from the same builders by the United Molasses Co. In most of the vessels built for foreign shipowners, Fiat single acting, two stroke, airless injection Diesel engines have been used with the exception of the vessels built for the Anglo-Saxon in which Werkspoor type, single acting, four stroke machinery has been used. In the motor tanker ordered by the United Molasses Co. for the Ansaldo Shipbuilding Co., a B. & W. Diesel engine of 4,000 hp. is to be fitted.

Of course, the attention of the shipbuilding and Diesel engine building world is being attracted to the building of tankers for Italian shipowners on which Diesel machinery has been fitted, using boilers for storage of Diesel oil, which allows the elimination of bunker tanks and permits more space in the hull for cargo tanks. The first motor tankers ordered in Italy, according to the new program of construction of merchant tonnage, were the motor tanker *Fede* and the motor tanker *Lavoro* ordered by Messrs. Achille Lauro of Naples for the Cantieri Riuniti dell'Adriatico at Trieste, which were delivered to their owners in the early part of this year after successful trials. The main dimensions of the Lauro tankers are summarized as follows:

Length at the floating line at full load	144.88	meters
Length between the perpendiculars	140.21	"
Breadth	10.36	"
Height to the deck	8.37	"
Gross tonnage	about 8,000	tons
D.W. capacity	12,200	"
Full load trial speed	13	knots

On these vessels have been fitted single acting, two stroke, airless injection Fiat Diesel engines of 3,600-3,800 hp. at 115-120 rpm. and 4,600 hp. at 130 rpm. These engines have eight cylinders with a diameter of 630 mm. and a stroke of 1,100 mm. The main engines are directly coupled not only to the fuel injection pumps and to the scavenging air pumps but also to the essential auxiliaries such as the fuel oil feeding, piston lubrication and cooling, pulverizer cooling, cylinder cooling and bilge pumps. Such arrangement has, however, been discontinued in the new 10,000 ton d.w. motor vessels which the same shipowners have ordered from the Cantieri Navali Riuniti of Palermo and which are to be provided with two similar Fiat Diesel engnes as the *Fede* and the *Lavoro* with



Vertical end section through a cylinder of the new two cycle, airless injection, crosshead type Diesel engine being developed by Franco Tosi for propulsion of Italian tankers.

Another Diesel-propelled tanker built for Standard Oil Company of New Jersey to operate in Italian service.

the only difference that direct coupling of the scavenging air pump will be eliminated and the sea water cooling of the cylinders is to be replaced with fresh water cooling. In addition to the main engine on both the *Fede* and the *Lavoro,* there is a Diesel engine coupled with an electric generating set of 16 kw. and a steam engine coupled to an electric generating set of the same capacity producing the necessary electricity for the operation of certain auxiliaries. During the sea trials in both cases the Lauro tankers reached a speed of over 15 knots at full load. The Fiat machinery is to be of the standard type already used on the Leme type of vessel of the Italia Line employed on the North Pacific route, while the Tosi machinery is of the above mentioned new type.

The Diesel engines, the construction of which Messrs. Franco Tosi of Legnano have started, are to be employed on the two motor vessels ordered from their Taranto Shipbuilding yard by the La Polena Società Anonima di Navigazione of Genoa, and by the Industrie Navali Società Anonima of Genoa. Each vessel is to be provided with a single acting, two stroke engine having the following characteristics:

Power in shop trials	6,670 hp.
Cylinders	8
Diameter of cylinders	700 mm.
Piston stroke	1,100 mm.
Revolutions per minute	145
Speed (average) of pistons	5.32 meters per sec.
Effective average pressure	6.12 Kg/sq. cm.

The engine consists of two parts, one represented by the bedplate and the other by the group of the cylinders connected between themselves by strong framing. Strong steel columns transmit directly to the bedplate and the stresses on the cylinder heads so that the framings are not called upon to support traction effort. The bedplate is of pig-iron and of considerable height in order to ensure the greatest rigidity, subdivided in sections connected between themselves with flanges, with closed bottom collecting the lubricating oil. The bedplate supports the crankshaft bearings which are in cast steel covered with white metal. The propeller shaft bearing is incorporated in the bedplate.

The cylinders are in cast steel built separately and connected with flanges in such a way as to form a longitudinal unit. The water cooling ports are particularly large so that the eventual deposits of salt will not greatly reduce the quantity of water going through each cylinder.

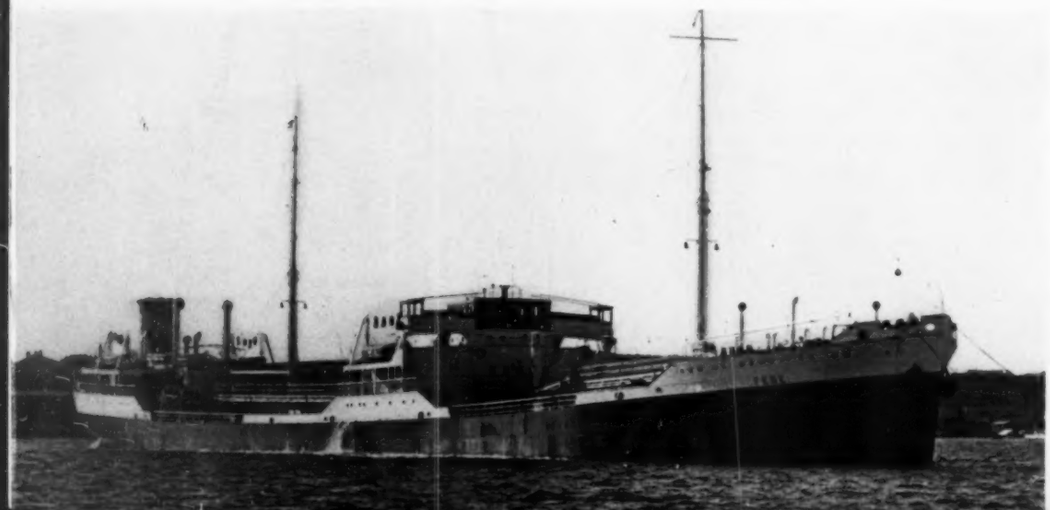
Each piston consists of three pieces. The bottom of special forged steel, the intermediate of cast iron which acts as guide in the casing, and the lower cover which has the function of sealing the low pressure gases. The bottom is directly connected to the piston liner by means of a strong flange. The cooling of the bottom is done with oil circulation independent of the lubrication circuit. In order to ensure efficient lubrication of the pistons, these enter the crank chamber in such a way that a small quantity of oil is always projected on the pistons themselves.

The connecting rods are in Martin Siemens steel, and are drilled for lubrication of the piston pins. The lower head is separated from the body in such a way that with the introduction of diaphragms it is possible to vary the height of the combustion chamber and, therefore, the final pressure of compression. Both upper and lower connecting rod bearings are built in cast steel covered with white metal.

The crank shaft is in high resistance steel and is flanged for coupling, on one side, to the shaft of the scavenging air pump, and on the other side to the extension of the propeller shaft. The shaft is built in two sections of four cranks each. The scavenging air pump is situated forward of the main engine, and is of the double acting two piston tandem type. All the valves are automatic. The pump is built in large sections in all the passages in order to reduce to a minimum the absorbed power.

The bearings of the crank shaft and the heads of the connecting rods are lubricated with oil circulation under pressure. The necessary oil for such lubrication is supplied by one gear pump driven by the main engine. The pulverization of the fuel is made directly according to the system already adopted by the Tosi Co. in many of their marine Diesel engines. The pulverizers are cooled with fresh water.

One of the first Diesel tankers ordered in Italy under the new program of merchant tonnage construction.

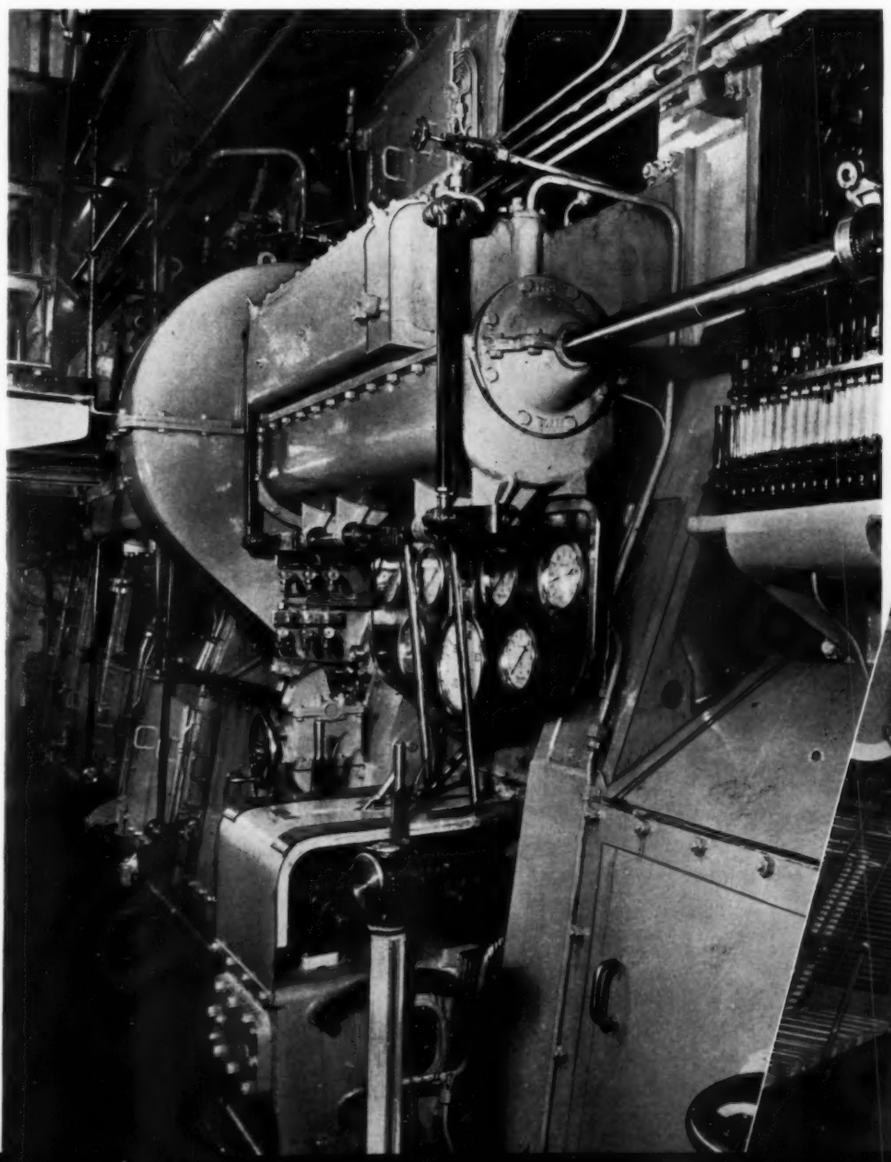


Owned by the Anglo-Saxon Petroleum Company also, the "Adinda" was built and Diesel-equipped by an Italian shipyard.

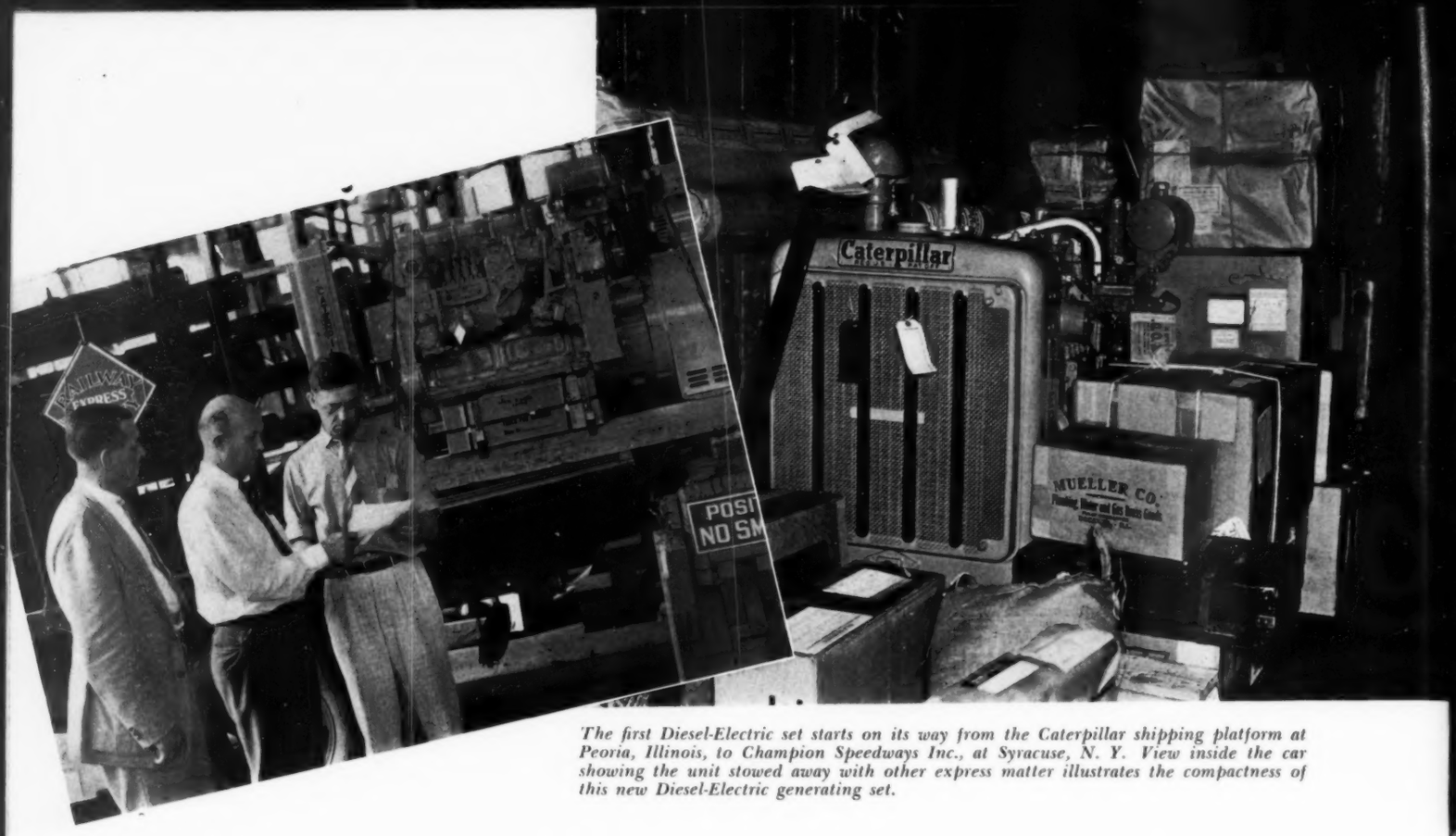
There is one fuel pump for each cylinder. There are two sets of fuel pumps. The movement to the pistons of the pumps is transmitted from the camshaft through rollers and guides. The aspiration valves work automatically during the descending stroke of the pistons and the depression caused in the pump chamber. The two pressing valves are also automatic. A regulation valve is controlled by a pointer in such a way that its opening is regulated according to the loading of the main engine. The lubricating oil pump is of the gear type and is driven by the shaft of the main engine. The oil aspirated from the service tank goes through the refrigerator, crossing first the filter and then going to the engine.

These engines are to a certain extent a derivation of the double acting, two stroke Tosi engines built for the Città di Genova class motor vessels of 6,000 tons engined by Tosi and recently converted with considerable success from air into airless injection units. It is stated in Italian shipping and shipbuilding quarters that, while the new engines might offer an interesting development for the propulsion of tankers, it should be noted that the Tosi Co. has already built several Diesel propelling engines for naval tankers up to 10,000 hp.

Control station of the two cycle, 3,800 hp. Diesel engine on the "Fede."



Top view of the nine cylinder, CRDA-Sulzer type Diesel engine which develops 6,800 hp. at 130 rpm. This engine is installed on another Italian tanker, the "Iridio Mantovani."



The first Diesel-Electric set starts on its way from the Caterpillar shipping platform at Peoria, Illinois, to Champion Speedways Inc., at Syracuse, N. Y. View inside the car showing the unit stowed away with other express matter illustrates the compactness of this new Diesel-Electric generating set.

DIESEL LIGHTS NIGHT RACES

By DWIGHT ROBISON

THE August issue of DIESEL PROGRESS carried an announcement of the new Caterpillar self-contained automatic Diesel-electric set. Now comes the story of the spectacular first sale of one of these units.

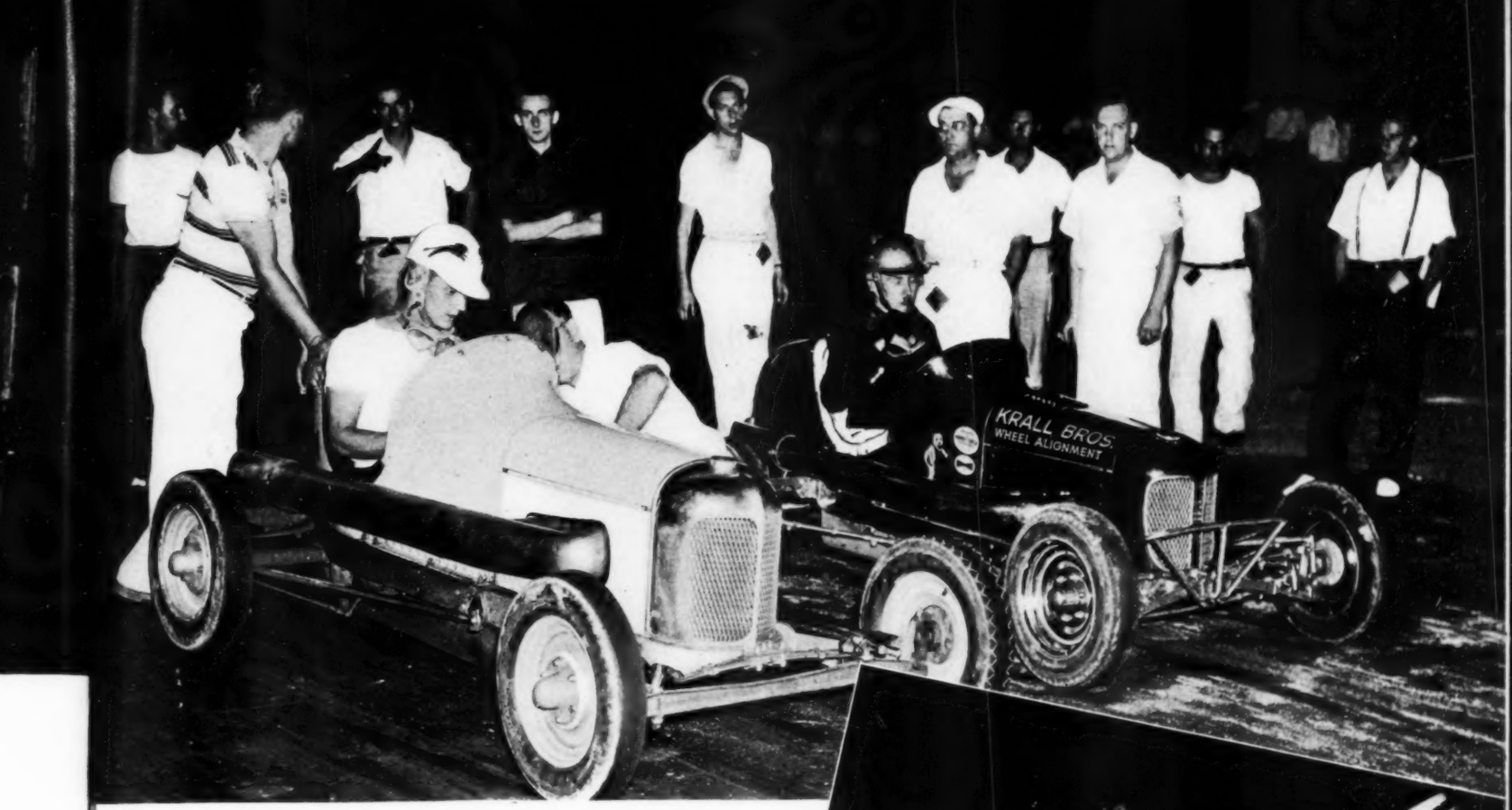
Champion Speedways, Inc., a midget auto race track at Syracuse, N. Y., decided to provide night racing for its patrons. To avoid charges of 6c per kwh., $200.00 for poles, plus a heavy deposit, the Speedways hit on the Diesel idea. From here on the Speedways demanded speed.

On August 2 they notified Syracuse Supply Co., Caterpillar distributors, that they must have a Diesel-electric set installed and ready to light the track Sunday night, August 6. It was found that a set could be started on its way from Peoria, Illinois, immediately. Shipped by express, the set arrived in Syracuse at 8:45 Saturday night, August 5. Unloading started at 10 P.M. and was completed at 10:40 P.M. At 11:10 the set arrived by truck at the track and at 11:30 it was unloaded. Servicemen started work at 11:30, had the engine running in fifteen minutes and at 11:50 there were lights on the track. Certainly this is a speed record in keeping with race track lore and an illustration of the availability of Diesel motive power for the generation of electricity.

But here are the figures which justify the Speedway's quick decision. Rough measurements of the amount of fuel oil used from an ordinary barrel, which was pressed into service as an emergency measure, indicated that the set was using about 1.2 gals. of oil per hour under a load of twelve 1,000 watt lights. On this basis the total operating cost was estimated at 10.5c an hour, including maintenance and lube oil. At the utility rate of 6c per kwh. the cost of the lighting would have been 72c an hour.

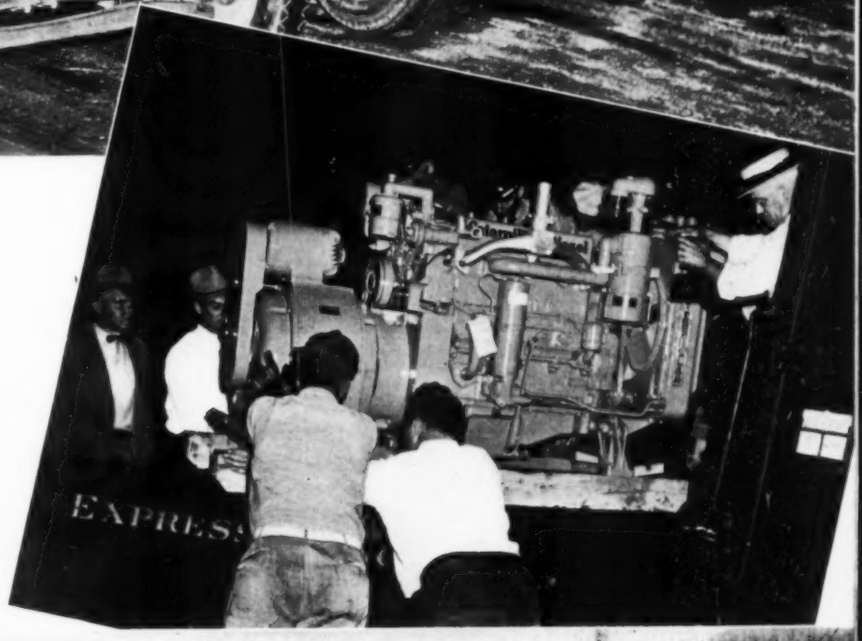
Based on lighting the track five hours per night for thirty night per month during seven summer months and twenty nights per month during five winter months, total production of 23,030 kwh. is estimated for the year. Operating and maintenance costs for the Diesel-electric set should total about $251.11 for the year. The cost of the utility service would be $846.90 for this period—a saving of $575.79 in favor of the Diesel unit.

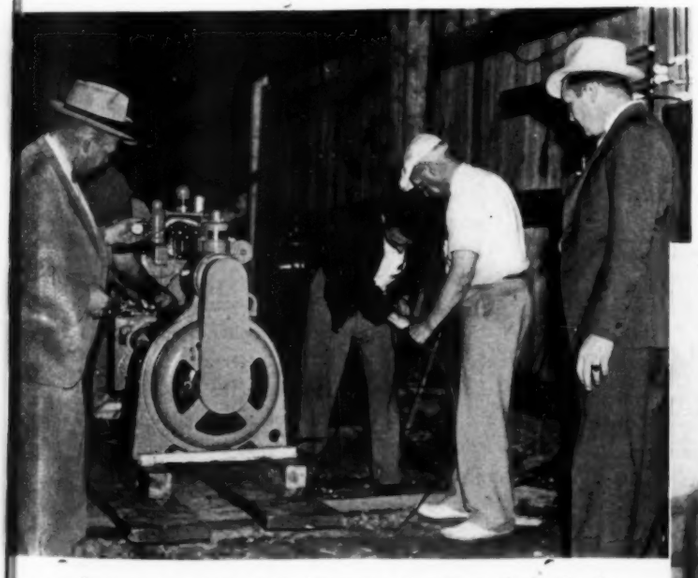
The Speedway officials are well pleased and are considering an additional Diesel-electric set for brilliantly lighting the Speedway entrance.



These two winners of the first night midget auto race held at the Syracuse track had an easy time seeing their way around at high speeds in the steady, brilliant lighting produced by the Diesel-Electric set.

Unloading the set from the express car at Syracuse appears to have been a white collar job.





A race official of the Champion Speedways clocks the time required to install the set. His watch showed twenty minutes from the time work started until the lights were turned on the track.

View showing the unusually simple installation of the self-contained generating set. The fuel oil barrel is temporary, otherwise the set-up is permanent as long as needed.

WORLD'S FAIR ELCO-53 SOLD

By WILL H. FULLERTON

ANNOUNCEMENT is made of the sale of the famous 53-ft. Elco motor yacht which forms part of the Radio Corporation of America's exhibit at the New York World's Fair, to Robert D. Scott of New Haven, Connecticut. DIESEL PROGRESS for May, 1939, carried a detailed description of the Elco-53.

This Diesel yacht, which has been frequently termed the "perfect yacht" because of its unusual facilities for comfort, convenience and safety, is now floating in a specially constructed pool in the Radiomarine exhibit at the Fair. It has been arranged that the yacht will be delivered to Mr. Scott shortly after the closing of the New York World's Fair on October 31st.

Powered with two six-cylinder Gray marine Diesel engines, the yacht has a speed of twenty miles per hour, and a cruising radius of some 500 miles, at three-quarter speed. Mr. Scott has decided to name the boat *Bonita II*. His former power cruiser, which made its home port at Essex, Connecticut, was also named the *Bonita*.

After taking delivery of the boat, Mr. Scott will cruise to Florida and will use it this winter in the general vicinity of Miami, the Keys and the West Coast of Florida.

The boat has accommodations for six in the owner's party and a crew of two. The crew's quarters and galley are forward of the deck saloon and are entirely shut off from the rest of the boat. The owner's stateroom, just forward of the after cockpit, has two built-in berths and a private lavatory with a fresh water shower. Forward of this are located a guests' lavatory and two single staterooms.

The controls of the boat are located on a flying bridge just over and aft of the large deck saloon which is luxuriously furnished with couches and chairs. The couches can be converted into comfortable berths when needed.

While on exhibit, the yacht was equipped with two RCA ship-to-shore telephones and a radio direction finder. The larger of the ship-to-shore telephones, located in the deck saloon of the yacht, has a radius of between 150 and 300 miles. The second of these instruments is located in the dinghy and operates off a 6-volt battery, with a radius of 25 miles. This latter telephone is used principally for communication with the mother ship. It is equally useful for communication with nearby shore stations.

During the time that the yacht was at the Fair, more than 1,500,000 people have inspected it. It is estimated that the total number of visitors exceeded 2,000,000 before the Fair closed.

PISTON RINGS

IN THE belief that the New York market could best be served by having its factory and storehouse together in the Metropolitan area, the Bi-Metal Piston Ring Corp. has just completed a new plant at 98-02 217th Lane, Queens Village, Long Island. At this plant seven thousand square feet of space has been set aside as a stock room, where a complete line of different sizes and makes of piston rings for Diesel and steam engines, pumps and compressors is carried available for immediate delivery.

Having a completely equipped machine shop and new equipment purchased with the express purpose of changing sizes, it is believed this program is the answer to the piston ring buyer's greatest trouble of the past, "Delay." Following further along these ideas of merchandising and practices of successful merchandisers in other lines, Bi-Metal Piston Ring Corp. is buying various makes of piston rings for stock.

In addition to carrying a complete line of standard compression and oil rings, the Bi-Metal Piston Ring Corp. manufactures a Bi-Metal ring consisting of a soft-wearing outer ring bonded to a strong inner ring, presenting a combination of wear and strength. These are known as the Barnes type rings.

COOPER - BESSEMER RECEIVES ORDER FOR SIX LOCOMOTIVE DIESELS

THE Cooper-Bessemer Corporation has recently received an order from the General Electric Company for six Type GN, 500 hp. Diesel engines. The engines will go into three Diesel-electric switching and transfer locomotives for the Ford Motor Company, making a total of eight of these 1,000 hp. switchers in service at the motor company's plant. The locomotives are of the streamlined type, embodying smooth exteriors, dual controls for double-end service and high visibility for operators.

NEW "PANCAKE" DIESELS

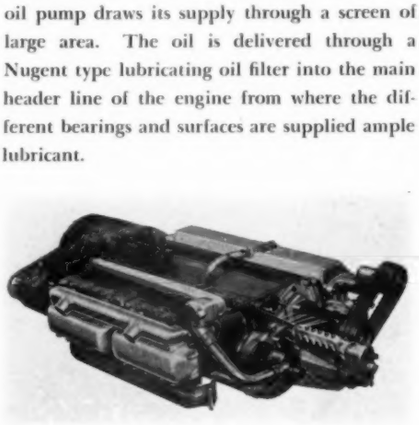
HERCULES MOTORS CORPORATION of Canton, Ohio, announces the addition of the DFX Series to its line of high-speed, heavy-duty engines. These engines are of horizontal or "pancake" design and were developed primarily for applications wherein limited space requires engines of minimum height. While differing in general design from the well-known Hercules vertical engines, these heavy-duty models are of relatively light weight and they feature the well known Hercules characteristics of economy and reliability.

The internal dimensions of the DFX Series of six-cylinder Hercules Diesels are as follows:

Model	*Bore*	*Stroke*	*Displacement*
DFXB	5 in.	6 in.	707 cu. in.
DFXC	5¼ in.	6 in.	779 cu. in.
DFXD	5½ in.	6 in.	855 cu. in.

Model DFXB develops 176 hp. at 1,800 rpm. and has a maximum torque of 530 at 1,300 rpm. Model DFXC develops 191 hp. at 1,800 rpm. and has a maximum torque of 535 at 1,300 rpm. Model DFXD develops 193 hp. at 1,600 rpm. and has a maximum torque of 645 at 1,300 rpm.

In designing the engine, special care was taken to assure proper lubrication. The oil capacity of DFX is exceptionally large, due to the use of an oil tank built directly into the oil pan. A scavenging pump keeps the sump of the engine dry and delivers all of the oil into the tank from which the pressure lubricating oil pump draws its supply through a screen of large area. The oil is delivered through a Nugent type lubricating oil filter into the main header line of the engine from where the different bearings and surfaces are supplied ample lubricant.



A water pump of abundant delivery assures proper cooling of oil in the engine parts and a carefully planned water circulating system eliminates any tendency toward hot spots. The fuel pump is built integral with a suitable governor and is driven either from the front of the camshaft or mounted at the top of the cylinder block and driven by chain. The cylinders of the new engines are of cast iron with removable dry type sleeves made from special alloy. The crankcase is of cast iron and is cast integral with the cylinder block. The engines have overhead valves with silchrome exhaust valves. Pistons are heat-treated aluminum alloy and piston pins are of the full floating type. The 7-bearing crankshaft is made of special steel with surface-hardened bearings.

BULLETIN 839, published by the Michiana Products Corporation, Michigan City, Indiana, describes and illustrates the complete line of Michiana and H-W Duo-Flo Type Oil Filters for use on gasoline and Diesel engines. The bulletin describes the various types such as the Re-Packable Element Type in which just the filtering material need be changed, as well as the Replaceable Element Type in which the complete filtering element is replaced. An interesting oil flow chart is included which clearly indicates the Duo-Flo principle of filtering as used in the Michiana Filters.

MORE DIESEL BUSES FOR CHICAGO

THE Chicago Motor Coach Company is now taking delivery of forty-four new Diesel buses from the Yellow Truck and Coach Manufactur-

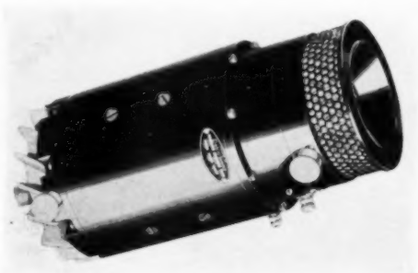
ing Company of Pontiac, Michigan, in preparation for the holiday rush.

These new single deck buses seat 45 passengers each. They are powered with General Motors six cylinder, two cycle Diesel engines. Smooth operation is assured by the use of hydraulic torque converters which take the place of clutches and conventional gear transmissions.

The satisfactory performance of fifty similar buses put in service by the company early this year led to the purchase of this addition to the Diesel bus fleet. Distinct advantages of the Diesel torque converter-equipped buses noted by the operators include smoother starting and stopping, and the absence of carbon monoxide in the exhaust.

DUST FILTER FOR HEAVY DUTY DELCO-REMY GENERATORS

To provide protection for the larger Delco-Remy air-cooled generators in applications in which excessive dust is encountered, Delco-Remy has made available an air filter designed on the principle of the carburetor air filter. This prevents dust, which might cause rapid brush and bearing wear, from being drawn into the generator with the cooling forced draft.



The air filter is being incorporated on the 8½ inch diameter frame size Delco-Remy generator illustrated above. A service package furnishing all parts required to adapt the air filter to Delco-Remy 8½ inch diameter frame size generators now in service is being supplied under package numbers 1878727 for counter-clockwise rotation generators, and 1878728 for clockwise rotation — rotation viewed from drive end. These packages are available through Delco-Remy's field service organization, United Motors Service.

BOUND VOLUMES

We have on hand four bound volumes of the twelve issues of Diesel Progress published in 1938. We also have four bound volumes of the twelve issues published in 1937. The price is $5 prepaid for either the 1937 or 1938 volumes. Send orders to Diesel Progress, 2 West 45th Street, New York City.

JOSEPH H. LEE APPOINTED

Joseph H. Lee has just been appointed manager of the lubricating department of the Shell Oil Company, Incorporated, of the eastern seaboard, according to an announcement made today by L. T. Kittinger, vice president in charge of marketing.

Mr. Lee was assistant manager of the lubricating department and replaces Clarence V. Beaton who has become associated with the Asiatic Petroleum Corporation.

Joining the Shell Company on the west coast as a salesman fifteen years ago, Mr. Lee has advanced steadily to his present position. He was a salesman less than one year when he was promoted to the lubricating department in San Francisco. He was later advanced to manager of that department in Honolulu. His next move was to the position of local manager of the Oakland, California, area and in 1937 came east as assistant manager of the lubricating department for the eastern company, which position he has held until his present advancement.

CARL BEHN DIES

WHEN Carl Behn, Vice-President of the American Bosch Corporation, Springfield, Massachusetts, passed away on November 15, the industry suffered a real loss and so did his thousands of friends throughout the country.

Carl Behn, since he joined the Bosch organization back in 1923, has consistently fought for a bigger and better Diesel Industry. It is too bad that such a constructive force for good should have been taken from us just in his prime, for Carl was only 43 years old.

GENERAL MOTORS 2-cycle Diesels, besides powering sleek streamlined passenger trains, U. S. Navy submarines, tugs, yachts, trucks and buses, cotton gins, ice refrigeration plants, are now milling gold near the Arctic

circle. Here is a shipment of Series 71 engines about to leave the plant of General Motors' Cleveland Diesel Engine Division for Alaska. There "packaged power" units may travel by rail, water, air and dog sled before reaching their ultimate destinations.

WAR ORDERS

AS touching the operations of the United States purchasing office of both the British and Canadian purchasing boards – these operations have commenced under the direction of Mr. A. B. Purvis at 25 Broadway, New York. "It is definitely known," states Hartley W. Barclay, in the November issue of *Purchasing*, "that purchases will include Diesel engines, airplanes and airplane engines, munitions and certain types of products not now available in sufficient quantity in Canada or Great Britain."

Latest Diesel Patents

A description of the outstanding patented inventions on Diesel and Diesel accessories as they are granted by the United States Patent Office. This information will be found a handy reference for inventors, engineers, designers and production men in establishing the dates of record, as well as describing the important Diesel inventions.

Conducted by C. CALVERT HINES*

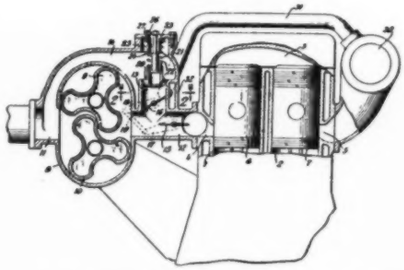
2,164,451

INTERNAL COMBUSTION ENGINE WITH BLOWER

Marion L. Fast, Detroit, Mich., assignor to General Motors Corporation, Detroit, Mich., a corporation of Delaware

Application September 18, 1937, Serial No. 164,459

7 Claims. (Cl. 123 — 119)



1. In an internal combustion engine, in combination, a blower for supplying air under pressure to the engine, a bypass from the outlet to the inlet side of the blower, valve means for varying the effective output of the blower and the amount of air supplied to the engine by controlling the quantity of air returned through the bypass and re-circulated through the blower, the quantity of air supplied to the engine being reduced as the quantity of air re-circulated through the blower is increased and vice versa, and a hot spot in the bypass whereby the air delivered under pressure from the blower to the engine is pre-heated to an extent increasing as the quantity of air re-circulated through the blower is increased and the quantity of air supplied to the engine is reduced.

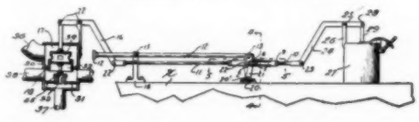
2,163,136

METHOD OF STARTING GOVERNED ENGINES

John H. Wren, Los Angeles, Calif.

Application June 14, 1937, Serial No. 148,124

6 Claims. (Cl. 123 — 112)



1. The method of starting an internal combustion engine having automatic means to control its speed and a fuel air mixing valve, which consists in manually releasing automatic control of the gas mixture, manually setting the gas mixture while the engine is turning at low speed, and then releasing manual control after the engine has started and to establish automatic regulation of the air-gas mixture by said mixing valve.

*Patent Attorney, 811 E Street, N.W., Washington, D.C.

2,166,634

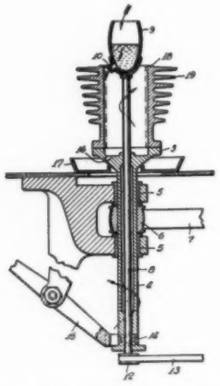
PROCESS FOR MAKING ENGINE CYLINDERS WITH AN INNER LINING

Alfred Lesage, Schweinfurt, Germany

Application February 17, 1938, Serial No. 190,960

In Germany February 15, 1937

1 Claim. (Cl. 22 – 203)



The method of making an internal combustion cylinder with a light metal jacket having radiating fins and a lining of metal of substantially greater hardness and of substantially higher melting point, which comprises the steps of rotating a vertically disposed jacket, projecting a jet of the molten harder metal within and radially of said cylinder jacket, and against the inner periphery of the latter, effecting relative rotation of said jet and said cylinder, and continuously moving said jet axially of said cylinder, said jet being so fine that the metal therefrom solidifies quickly on the inner surface of the cylinder as a helical strip, and fuses only the inner surface portion of the cylinder jacket on which it is projected, to form a thin intermediate layer alloyed from said light metal and said harder metal, said jacket being rotated at such high speed, that adjacent turns of said helical strip are levelled off by centrifugal action to form a comparatively smooth substantially uniform continuous lining on said jacket under the cooling effected by radiation from said fins.

2,164,151

DIESEL FUEL

George S. Crandall, Woodbury, and William H. James, Paulsboro, N. J., assignors to Socony-Vacuum Oil Company, Incorporated, New York, N. Y. a corporation of New York

No Drawing. Application October 29, 1937. Serial No. 171,670

7 Claims. (Cl. 44 – 9)

1. An improved Diesel fuel comprising: hydrocarbon fuel oil and in admixture therewith a minor proportion of a bis (aminoaryl) disulfide.

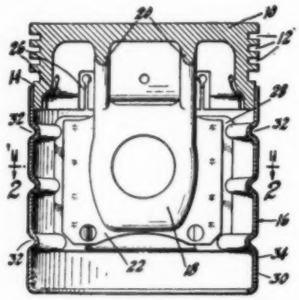
2,162,830

COMPOSITE PISTON

Caleb E. Summers, Pontiac, Mich., assignor to General Motors Corporation, Detroit, Mich., a corporation of Delaware

Application December 3, 1934, Serial No. 755,651

4 Claims. (Cl. 309 – 14)



1. A piston comprising a cast head having integral piston pin bosses, plates inseparably interlocked with the metal of the bosses and extending at right angles to the axis of the piston pin bosses, a sheet metal skirt having its upper portion in telescoping engagement with the lower portion of the head, the portion of the head overlapped by the skirt between the bosses being slotted throughout its length to permit expansion of the head without distortion of the corresponding portions of the skirt, the skirt being provided with inwardly pressed trough-shaped longitudinal ribs whose longitudinal edges are joined to the skirt engaging the plates and welded thereto, said ribs and plates constituting a re-enforced connection between the head and skirt, and a coating of soft bearing metal on the outer bearing surface of the skirt.

2,165,222

ENGINE AND ENGINE COMPRESSOR

Henri Capdet, Toulouse, France.

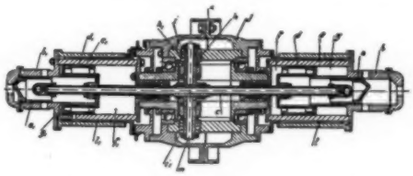
Application May 28, 1934, Serial No. 728,040

In France June 3, 1933

1 Claim. (Cl. 123 – 56)

An internal combustion engine which comprises, in combination, two cylinders mounted in line with each other in opposite relation, each cylinder having three working chambers, one for combustion, one for pre-compression of the charge supplied to the combustion chamber, and the third for compression of a fluid separate

from the charge, a piston in each of said cylinders, each piston having three operating faces corresponding with the three chambers of the corresponding cylinders, respectively, and means for rigidly interconnecting said two pistons, said cylinders forming a single casing provided at each end with an inwardly extending cylindrical projection leaving an annular space between itself and the inner wall of the corresponding cylinder and provided in its intermediate part with a partition having a hole formed therein, said pistons being hollow and open at their outer ends so as to fit in said annular space, said inter-connecting rigid means consisting of



a rod fitting slidably in the hole of said partition, whereby each combustion chamber is formed between each of said projections and the inside of the corresponding piston end, each fluid compression chamber is formed by the annular space around each of said projections, as limited by the outer edge of the corresponding piston end, and each pre-compression chamber is formed between said partition of the casing and the rear face of each of said piston ends respectively, said casing and said hollow piston ends being provided with ports and at least one passage for interconnecting said chambers.

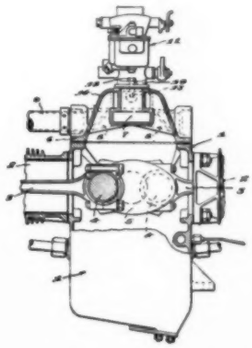
2,166,398

INTERNAL COMBUSTION ENGINE

Carl T. Doman, Geddes, N. Y., assignor to Air Cooled Motors Corporation, Liverpool, N. Y., a corporation of New York

Application April 5, 1938, Serial No. 200,158

2 Claims. (Cl. 123 — 122)



1. An internal combustion engine including a crank case serving as an oil sump, cylinders mounted on the crank case and extending in opposite directions therefrom, a crank shaft in the crank case, pistons movable in the cylinders and operatively connected to the crank shaft, the crank case having a top wall formed with an intake manifold including a distributing chamber opening through the upper face of said wall for connection to a carburetor and depending in the space below said wall, whereby its lower end and sides are exposed to the splashing oil in the crank case, and branches extending from the distributing chamber for connection to the intake pipes of the cylinders, the branches being on the lower side of the top wall whereby the lower portions and lateral sides of said branches being also exposed to the splashing oil.

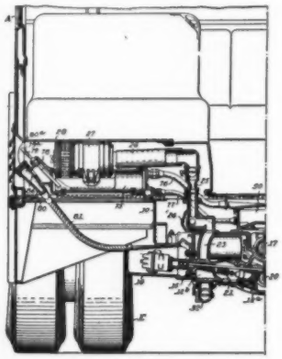
2,165,909

LUBRICATING SYSTEM FOR MOTOR VEHICLE ENGINES

William R. Spiller, Cleveland, Ohio, assignor to The White Motor Company, Cleveland, Ohio, a corporation of Ohio

Application October 5, 1934, Serial No. 747,008

5 Claims. (Cl. 184 – 6)



1. In a horizontal dry sump engine of small depth and intended to be supported beneath the flooring of an automobile, said engine being constructed with a lubricating system comprising a supply reservoir located in the upper part of the engine, a receiving reservoir located in the lower part of the engine, a third reservoir forming a separate unit from said engine located at one side of said engine at a higher level than the flooring of the automobile, a conduit connecting said third reservoir with said supply reservoir communicating at one end with the bottom of said third reservoir and at its other end with the bottom of said supply reservoir, a second conduit connecting said third reservoir with said supply reservoir communicating at one end with the top of said third reservoir and at its other end with the top of said supply reservoir, a third conduit communicating at its upper end with the upper portion of said third reservoir and at its lower end with said receiving reservoir, means for delivering oil from said supply reservoir to the bearings of said engine, and means for delivering oil from said receiving reservoir into said supply reservoir capable of effecting the delivery of more oil from said receiving reservoir than is received therein from said supply reservoir.

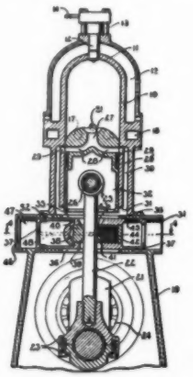
2,164,439

INTERNAL COMBUSTION ENGINE

Allan R. Wurtele, Mix, La.

Application June 29, 1937, Serial No. 150,888

5 Claims. (Cl. 123—74)



3. In an internal combustion engine, a power cylinder, a crankshaft, a connecting rod connecting said piston and crankshaft, and means for forming an air-tight chamber in the bottom of said cylinder below said piston comprising a transverse cylinder, a piston valve therein and a plunger slidably mounted in said valve, said transverse cylinder, piston valve and plunger having registering openings therein for the passage of said connecting rod and resilient means for holding said plunger in engagement with said rod.

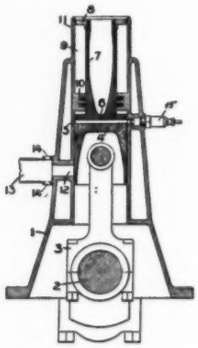
DIESEL PROGRESS

INDEX OF ADVERTISERS

2,166,464

INTERNAL COMBUSTION ENGINE

Clarence D. Davis, Chicago, Ill.
Application August 19, 1935, Serial No. 36,783
Renewed November 18, 1938
10 Claims. (Cl. 123 – 66)



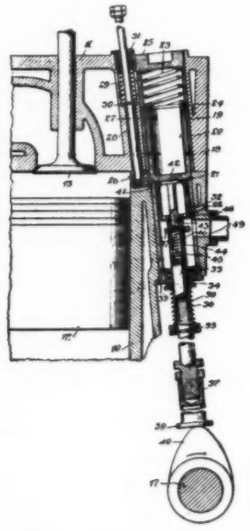
3. In an internal combustion engine the combination of a cylinder, a crankshaft, a main piston in said cylinder operatively connected to said crankshaft for performing compression and power strokes, a secondary piston in said cylinder opposed to said main piston for performing scavenging and suction strokes, means of absorbing, in a fluid compression chamber, energy of the charge between said pistons, means of applying the energy in said compression chamber for operating said secondary piston on a scavenging stroke, means of absorbing, in a second fluid compression chamber, the kinetic energy of said secondary piston on the scavenging stroke, means of applying the energy in the last mentioned compression chamber for operating said secondary piston on an induction stroke, and inlet and exhaust ports in said cylinder controlled by said main piston.

2,162,473

OIL ENGINE

John F. Anders, Kitchawan, N. Y.
Application January 21, 1938, Serial No. 186,076
6 Claims. (Cl. 123 – 143)

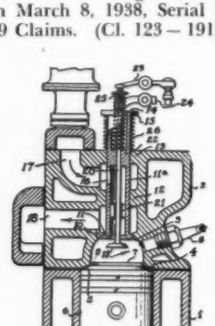
1. An injector assemblage for an oil burning engine comprising an injection nozzle, a valve for normally closing said nozzle, a tubular member continually in communication with said nozzle, a pressure head slidingly mounted in said tubular member, a spring for moving said head to one extreme position, means for limiting the movement of said pressure head in one direction so that its end will be substantially in line with said nozzle, a piston in said tubular member for pressing a combustible mixture against said pressure head until said head has moved against the action of said spring away from said nozzle and until the mixture is ignited, means for causing said piston to function, and means for opening the valve in said nozzle at the time said mixture has reached the ignition point.



2,166,679

COMBUSTION CHAMBER FOR AN INTERNAL COMBUSTION ENGINE

James P. Burke, Knoxville, Tenn., assignor of one-half to F. L. McLaughlin, Detroit, Mich.
Application March 8, 1938, Serial No. 194,638
9 Claims. (Cl. 123 – 191)



1. A combustion chamber for an engine cylinder having a piston therein comprising a lower portion of frusto conical shape in any vertical section taken transversely of the wrist pin of the piston, substantially vertical sidewalls arising from the small base of the frusto cone and terminating in a top portion curved in any vertical section, said chamber being of substantially equal diameter with the diameter of the cylinder in a diametric vertical section containing the axis of said wrist pin, and substantially vertical side walls extending from said top portion down to the top of said cylinder between the side walls of said frusto cone.

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Buda-Lanova Diesels
Busch-Sulzer Bros. 2-cycle
Busch-Sulzer Bros. 4-cycle
Caterpillar Industrial Engines
Caterpillar Marine Engines
Chicago Pneumatic Model 8-CP
Chicago Pneumatic Type RHB
Chicago Penumatic RHB-100
Clark Bros. Diesels
Clerget Aviation Diesel
Coatalen Aviation Diesel
Cooper-Bessemer Type EN and GN
Cooper-Bessemer Type JTB
Cummins Diesels
Davis & Thompson Yankee Diesel
De La Vergne Type VA
De La Vergne Model VB
De La Vergne Model VE
De La Vergne Model VG
De La Vergne Model VM
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Fairbanks-Morse Model 36-A-8
Fairbanks-Morse Model 42-E
Fairbanks-Morse 32 and 35
Fairbanks-Morse Model 38
Fairbanks-Morse Model 46
General Motors Model 71
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Gray Marine Diesels
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Venn-Severin Model "D"
Victor Horizontal Type
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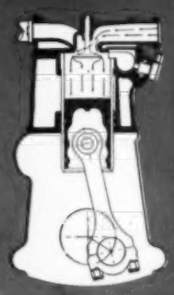
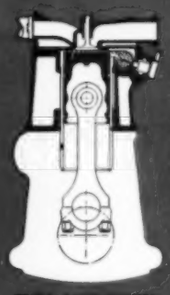
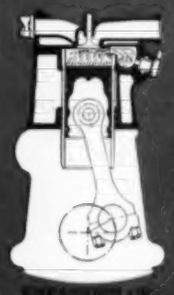
Witte Types
Worthington Diesels
Z.O.D. Aviation Diesels


INTAKE STROKE.


COMPRESSION STROKE.


FUEL INJECTION.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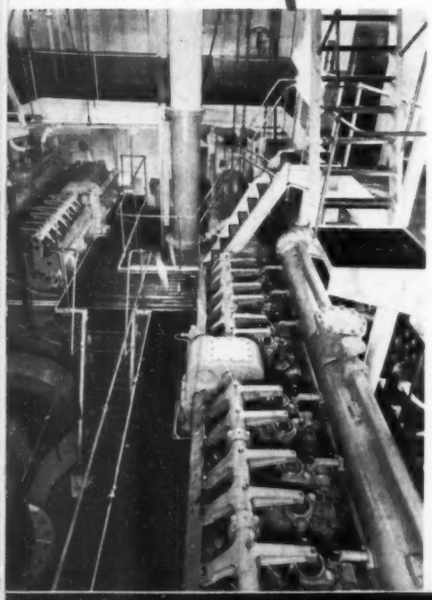

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